STATE OF MISSOURI
Mel Carnahan, Governor • Stephen M. Mahfood, Director
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF ENVIRONMENTAL QUALITY
P.O. Box 176 Jefferson City, MO 65102-0176

July 20, 1999

Mr. David Garrett
RCRA Corrective Action
and Permits Branch
U.S. EPA Region VII
Mail Code ARTD/RCAP
901 N. 5th Street
Kansas City, KS 66101

Dear Mr. Garrett:

Per our conversation on Thursday, July 15, 1999, I have enclosed a copy of the "Summary Report of Investigative and Remedial Activities Conducted to Achieve Closure of the Interim TSD Facility," dated August 24, 1998, and "Work Plan, Dye Tracing Investigation," dated April 15, 1999, for the Modine Manufacturing Company in Camdenton, Missouri. Should you require any additional information or have questions, please feel free to contact me at (573) 751-3068 or nrkump@mail.dnr.state.mo.us. I look forward to working with you on this project.

Sincerely,

HAZARDOUS WASTE PROGRAM

Christine M. Kump
Environmental Engineer
Permits Section

CMK:bi

Enclosure

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

721 Emerson Road, Suite 220
Saint Louis, Missouri 63141-6748
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April 15, 1999

Ms. Christine M. Kump
State of Missouri
Department of Natural Resources
Hazardous Waste Program
1738 E. Elm Street
Jefferson City, Missouri 65101-4130

Re: Work Plan
Dye Tracing Investigation
Modine Manufacturing Company
Camdenton, Missouri
Dames & Moore Project No. 27397-035-045

Dear Ms. Kump:

On behalf of Modine Manufacturing Company (Modine), Dames & Moore is submitting this brief Work Plan to perform additional investigation of the groundwater system near and underlying the Modine Heat Transfer, Inc. facility in Camdenton, Missouri (Site). Previous investigations have detected the presence of trichloroethylene (TCE) in groundwater in the subsurface at and near the Modine facility. Subsequent investigations also determined that fracture flow may be an important mechanism for transport of the TCE in the subsurface and that the most probable cause for TCE impact is movement of TCE onto and through the Site, from off-site sources. The most obvious offsite source of TCE is the former Hulett Lagoon, located approximately 1,000 feet northeast of the Modine facility. Groundwater at the former Hulett Lagoon has been impacted by TCE, as indicated by analysis of water from well MW-5, located at this former lagoon. It has also been established that groundwater appears to flow generally from this former lagoon toward the Site

The Scope of Work proposed in this Work Plan is intended to further define the fluid flow regime near and beneath the Modine facility and to test the possibility that (1) the former Hulett Lagoon is an offsite source of the TCE-impact to groundwater at the Site and (2) assess the movement of trapped water beneath the Modine building.

This document is not intended to be a full Resource Conservation and Recovery Act (RCRA) Work Plan, but is intended to seek approval for one phase of work, dye testing. A full RCRA Work Plan will be developed following receipt of the Administrative Order on Consent from the Missouri Department of Natural Resources (MDNR). Investigative requirements to be included in the Work Plan will be based on the results of this investigation and previous investigations.

1.0 BACKGROUND

The Modine Heat Transfer, Inc. site is located on Sunset Drive in Camdenton, Missouri. The Modine property occupies approximately 67 acres in Section 26, Township 38 North, Range 17 West in Camden County, Camdenton, Missouri. The manufacturing plant at the site occupies approximately 120,000 square feet and has undergone four major construction additions through its history (1971, 1973, 1979, and 1983).

The facility was originally owned and operated by Dawson Metal Products which began manufacturing operations at the Site in 1967. Sundstrand Tubular Products (Sundstrand) purchased the site in 1972 and operated it until 1990. Modine Heat Transfer, Inc., (Modine), a wholly owned subsidiary of Modine Manufacturing Company, purchased the Site in October of 1990. The site has always been utilized for the manufacture of aluminum and copper coils and feeder parts used in the manufacture of heat transfer products.

2.0 SITE SETTING

The geological and hydrogeological site setting for the Site has been discussed in several previous reports including: "Work Plan Modification to achieve Final Closure of the Interim TSD Facility", dated June 1, 1995, "Findings of an Investigation to Achieve Final Closure", dated February 12, 1996, "Final Report of Fracture System Investigation, Modine Heat Transfer, Inc., Camdenton, Missouri", dated July 17, 1996; and the "Comprehensive Monitoring Evaluation Report" prepared by MDNR, dated January, 1998, and others. Therefore, geological and hydrogeological conditions at the Site are only briefly summarized in the following paragraphs.

The bedrock unit lying directly below the soil at the site is a cherty dolomite of the Ordovician age Roubidoux Formation. The Roubidoux Formation is generally 130 to 150 feet thick and consists of cherty dolomite, chert, and sandstone. The formation has layers of hard, brittle chert. Based upon the results of the August 1995 investigation, it appears that competent bedrock is present beneath the site at depths ranging from approximately 30 to 60 feet below ground surface (bgs).

The bedrock is gently dipping at a rate of approximately 0.02 feet per foot or less (approximately 1.1 degrees or less) and exhibits a trough-like surface. This surface resembles the groundwater surface, which has been measured for these wells. The majority of all of the fractures are vertical or nearly vertical, with a strongly preferred orientation of the fractures trending overall N 50° E.

Groundwater beneath the Site is substantially deep, ranging from approximately 150 to 160 feet bgs. The average terrain of the Site is approximately 160 to 170 feet above the surrounding valley

floors, so that most of the groundwater transport down to the level of the surrounding valley floors is in the unsaturated zone. Based upon the findings from the field fracture survey and accompanying logging, the primary direction of transport in the unsaturated zone is vertically downward, and the primary mechanism is through fractures in the dolomite, since the formation has little primary porosity. Upon reaching the saturated zone, the direction of transport changes abruptly to follow the regional potentiometric surface, which should be generally to the southwest. The direction of flow beneath the Site is expected to be substantially influenced by the strong preferred fracture orientation of N 50o E (northeast-southwest).

2.1 Groundwater

The groundwater movement through the dolomite bedrock is via secondary porosity such as fractures and solution channeling. Potentiometric surfaces have been derived from groundwater level measurements taken during the quarterly groundwater monitoring events. Data from these events indicate a trough-like surface, which is lowest in the central western portion of the Site. Since fluid flow is primarily through secondary porosity (fractures) it is reasonable to assume that fracture directions will have a strong influence on the direction of groundwater flow.

2.2 Trapped Water in the Gravel Subgrade

Trapped water within the gravel subgrade beneath the building floor exhibited elevated VOC concentrations as indicated by the results obtained from sampling over time from the removable threaded plug and countersink installed at the former boring location HA-5. Boring HA-5 was installed by Law Environmental in 1991 as part of an investigation of the monorail vapor degreaser. This observed impact may be related to historical releases in the area of the former monorail vapor degreaser. The trapped water does not appear to be adversely impacting the underlying soil to a significant degree as illustrated in the soil samples collected as part of the investigation conducted by Dames & Moore in 1997 prior to decommissioning of that unit. During decommissioning, the gravel subgrade was removed and the floor in the area brought to grade and capped with concrete.

MDNR believes that the elevated VOC concentrations in the trapped water are potentially related to leaks from the wastewater collection piping located within this gravel subgrade beneath the concrete floor. It should be noted that these subgrade lines are not solvent lines. All former solvent delivery and reclaiming lines were run overhead and not subgrade. The primary concern related to this trapped water is the potential migration pathway for the elevated VOC concentrations.

3.0 SCOPE OF WORK

In order to determine (1) the migration pathway of trapped water beneath the building foundation and (2) if TCE in groundwater from the former Hulett Lagoon is impacting MW-4, the following Scope of Work is proposed.

Task 1 Installation and Sampling of Well MW-6

A shallow monitoring well, completed to the top of bedrock, will be installed along the west side of the building wall, near the former locations of mud pits #3 and #4. The top of bedrock, and therefore well completion depth is anticipated to be at a depth of 50 feet bgs or less. The well will be drilled and sampled using hollow-stem auger technology and split spoons. Soil sampling will be continuous to total depth. The well will be cased with two-inch diameter PVC casing and slotted screen. The well will be drilled according to the protocols in the Missouri Well Construction rules (December, 1993) and will be properly registered. All drilling equipment will be properly decontaminated. Decontamination water and drill cuttings, will be containerized in support of proper disposal. The newly installed well will be properly developed using a dedicated bailer.

After development, the well will be purged for sampling, and a minimum of three well volumes of water will be extracted and will be containerized for proper disposal. A groundwater sample will be recovered for analysis of volatile organic compounds by USEPA Method 8260. The well will also serve as an observation point for the rhodamine dye test.

It should be noted that this well will likely be dry during portions of the year.

Task 2 Establish Background Rhodamine and Fluorescein Levels

Charcoal packets will be suspended within the four on-site bedrock wells, the newly installed shallow well (MW-6) and the well at the former Hulett Lagoon (MW-5). These packets will be allowed to accumulate rhodamine and fluorescein dyes in groundwater. This action will allow determination of background levels of fluorescein and rhodamine, if any, for a period of one week. Charcoal packets suspended in the six wells will be recovered and tested using spectrofluorometer analysis at Ozark Underground Laboratory in Protem, Missouri.

Task 3 Dye Injection and Testing

Rhodamine Dye Test

Dye tracing using rhodamine dye will be implemented to determine where the trapped water surfaces (if it does), and the direction of lateral movement. It is currently assumed that the trapped water migrates laterally along the slope of the bedrock surface, which is assumed to be to the west. The MDNR believes that the potential exists that the elevated VOC concentrations at depth in former boring B-13 may be related to impact in the trapped water via transient flow from beneath the building. MW-4 will also be monitored to assess if migration of the trapped water contributes to VOCs observed in MW-4.

Rhodamine dye will be injected beneath the building foundation. Approximately 1.2 ounces of rhodamine dye in 10 gallons of water will be introduced beneath the building foundation, through direct push tools which will be advanced for this purpose. The injection point will be along the eastern exterior wall. Direct push equipment will be directionally advanced to the extent possible, to establish an injection point underneath the foundation within the gravel subgrade. The lithology of the penetrated soil will be monitored to ensure that the dye is injected into the sub-foundation gravel.

Charcoal packets will be placed in the shallow observation well (MW-6) as well as all four of the on-site bedrock monitoring wells to assess potential groundwater communication.

Fluorescein Dye Test

Fluorescein dye will be injected into groundwater at MW-5, located at the former Hulett Lagoon. An initial dye test using a modest amount of dye will be conducted. Approximately six ounces of fluorescein dye will be mixed with approximately 50 gallons of potable water, for injection into MW-5. Charcoal packets will be placed in the four on-site bedrock monitoring wells.

After dye injection, charcoal packets will be removed for analysis and replaced with new packets on a weekly basis for approximately six weeks. Charcoal packets will be tested for amount and type of fluorescent dye.

5.0 PROJECT SCHEDULE

The actual start date for these activities will be dependant on MDNR approval. Once approval is granted, the project is expected to proceed in accordance with the following schedule.

Week 1
Install and sample well MW-6. Place packets in all five on-site wells to check for rhodamine and fluorescein background levels.

Week 2
Extract and test charcoal packets to determine background fluorescence. Inject rhodamine and fluorescein dyes.

Week 3
Remove old packets for analysis and insert new ones.

Week 4
Remove old packets for analysis and insert new ones.

Week 5
Remove old packets for analysis and insert new ones.

Week 6
Remove old packets for analysis and insert new ones. The project may be over, depending on movements rates of injected dyes.

Note: If no dye has been detected, the monitoring will continue for two additional weeks.

6.0 DELIVERABLES

Dames & Moore will supply a summary report of dye testing results within six weeks of receipt of the last fluorescence data from the laboratory.

7.0 RCRA REQUIREMENTS

All activities defined herein will be conducted in accordance with the previously submitted (June 2, 1998) Field Sampling Plan (FSP), Health & Safety Plan (HASP), and Quality Assurance Plan (QAP).

Ms. Christine M. Kump
Department of Natural Resources
Dames & Moore Project No. 27397-035-045
April 15, 1999

Please do not hesitate to contact either of the undersigned if you have any questions.

Very truly yours,

DAMES & MOORE

J. Ronald Sides, Ph.D., R.G.
Senior Geologist

Daniel J. Price, R.G.
Associate

Enclosure
JRS:pkm
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DAMES & MOORE

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SUMMARY REPORT OF INVESTIGATIVE AND REMEDIAL ACTIVITIES CONDUCTED TO ACHIEVE CLOSURE OF THE INTERIM TSD FACILITY MODINE MANUFACTURING COMPANY CAMDENTON, MISSOURI

PREPARED FOR
MODINE MANUFACTURING COMPANY

Dames & Moore Project No. 27397-035-045
August 24, 1998

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1.0 Introduction

A meeting was held between Modine Manufacturing Company (Modine) and the Missouri Department of Natural Resources (MDNR) on July 24, 1998. During this meeting, the MDNR indicated that it would be beneficial for them to have a report summarizing the results of all the activities that have been conducted at the Modine Heat Transfer facility concerning the closure of the TSD facility. Therefore, Modine representatives requested that Dames & Moore prepare such a summary report. The purpose of the summary report is to concisely illustrate the volume of investigative work conducted and the results derived from this work. Investigative efforts are summarized in chronological order in Sections 4.0 through 17.0 of this report.

2.0 Site Description

The Modine facility (Site) is located on Sunset Drive in Camdenton, Missouri. The Site occupies approximately 67 acres in Section 26, Township 38 North, Range 17 West in Camden County. The manufacturing plant at the Site occupies approximately 83,000 square feet and has undergone five construction additions through its history (1971, 1973, 1979, 1983, and 1997).

Operations began at the Site in 1967 under the ownership of Dawson Metal Products. Sundstrand Tubular Products (Sundstrand) purchased the Site in 1972 and operated it until 1990. Modine Heat Transfer, Inc., a wholly owned subsidiary of Modine Manufacturing Company, purchased the Site in October, 1990. The Site has always been utilized in the manufacture of aluminum and copper coils and feeder parts used in the manufacture of heat transfer products.

3.0 Brief Regulatory History

A Resource Conservation and Recovery Act (RCRA) Part A Permit application to operate a storage facility was submitted to the U.S. Environmental Protection Agency (USEPA) by Sundstrand in November, 1980. Revisions to the Part A permit were filed in 1983 and 1990. A RCRA Part B Permit application was never filed; therefore, the facility has been operating as a TSD facility under interim status.

Prior to purchase of the Site by Modine, Sundstrand submitted a Closure Plan in September, 1990 to terminate its interim status and hold generator status only. The Closure Plan addressed three former storage areas. The three areas covered by the Closure Plan include:

- Area 1: 1972 - 1983 Drum Storage Area
- Area 2: 1983 - 1985 Drum Storage Area
- Area 3: 1985 - 1990 Drum Storage Area

The locations of these three areas are illustrated on Figure 1. The Closure Plan was revised by Modine in February, 1992 and approved with modifications by the MDNR in November, 1992.

4.0 Environmental Site Assessment - Law Environmental Report Dated November, 1991

The plant generated trichloroethene (TCE) waste during degreasing operations from 1970 to December, 1989. Since Modine took over operations in December, 1990, the plant has used 1,1,1-trichloroethane (TCA) for degreasing operations. According to Modine, the TCE waste was containerized in 55 gallon drums and stored outside the plant in two separate locations from 1972 to 1985. An additional drum storage area, identified as SWMU#31 in the Preliminary Assessment Report prepared by Jacobs Engineering (refer to Section 5.0), was reportedly located along the south outer wall of the plant. This SWMU was misidentified by Jacobs as Drum Storage Area #3. The area was actually used for storage of old equipment and was never used for the storage of any solvent wastes. However, at the time of the Jacobs inspection several drums of water and soda ash from a degreaser cleanout were located in this general area. Modine suggested to MDNR that an alleged 4,500 gallon release of spent solvent also occurred at the plant in this general vicinity. A building addition was erected over the alleged spill area in 1983. Storage area #3 is the current storage area, which is a fully enclosed room inside the facility that includes both bulk and drum storage.

Five locations were hand augered in an area surrounding a monorail vapor degreaser. Three of these borings (HA-1, HA-2, and HA-3) were drilled from the plant floor surface and two from the floor of the concrete lined pit associated with a vapor degreaser currently in this area. The base of the pit is approximately 5.5 feet below the plant floor surface. The location of these hand augered borings, designated HA, are depicted on Figure 2.

Four soil boring were advanced at locations in or near the storage area located along the outer west wall. Two borings (B-1 and B-2) were drilled in the gravel area near the west wall of the plant. A third boring (B-3) was drilled in an area that Modine believed was a former surface water drainage feature. A fourth boring (B-4) was drilled near the assumed location of a storm-water drainage pipe to assess the possibility of containment migration along the pipe trench. The location of these borings, designated B, are depicted on Figure 3.

Eleven compounds were detected in the soil samples from around the vapor degreaser pit area. These compounds included: TCE; tetrachloroethene (PCE); methylene chloride; trichloroflouromethane; vinyl chloride; 1,1-dichloroethane (1,1-DCA); TCA; 1,2-dichloroethane (1,2-DCA); trans-1,3-dichloropropene; 1,1,2-trichloroethane; and chloroform.

Seven compounds were detected in the soil samples from the area west of the mechanical room/pre-treatment area. These compounds included: TCE; PCE; methylene chloride; vinyl chloride; TCA; trans-1,2-dichloroethene; and 1,1-DCA.

Concentrations for these compounds are presented in the following table:

Sample ID Sample Depth (feet)	HA-1 2.0-4.0	HA-2 4.0-4.3	HA-3 0-2.0	HA-4 0-0.75	HA-5 0-2.0	B-1 2.0-4.0	B-2 2.0-4.3	B-3 2.0-4.0	B-4 4.0-8.0
Parameters									
Vinyl Chloride	ND	ND	ND	ND	0.027	ND	ND	ND	0.078
Trichloroflouromethane	ND	ND	ND	ND	0.011	ND	ND	ND	ND
1,1-Dichloroethene	ND	ND	0.0041	ND	ND	ND	ND	ND	ND
Methylene Chloride	ND	ND	ND	ND	0.61	0.0084	0.0048	ND	ND
trans-1,2-Dichloroethene	ND	ND	ND	ND	0.016	ND	ND	ND	0.012
1,1-Dichloroethane	ND	ND	ND	ND	0.072	0.0062	ND	ND	ND
Chloroform	0.0018	ND	ND	ND	0.083	ND	ND	ND	ND
1,1,1-Trichloroethane	0.55	0.014	0.014	0.0018	200	0.16	0.0012	0.0059	ND
1,2-Dichloroethane	ND	ND	ND	ND	0.420	ND	ND	ND	ND
Trichloroethene	3.0	0.029	0.010	ND	0.780	0.061	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	0.027	ND	ND	ND	ND
Tetrachloroethene	0.036	ND	ND	ND	0.130	0.0058	ND	ND	ND

Concentrations in ppm

ND - Not detected above the laboratory reporting limit

None of these VOC concentrations exceed the corresponding Missouri Any-Use Soil Level (ASL).

A removable threaded plug and countersink was installed at the boring location HA-5 which exhibited the 200 ppm TCA concentration. This was done to allow for future sampling access of accumulated fluid in the gravel subgrade beneath the concrete floor. Results from this periodic sampling are presented in the following table:

Collection Date	9/16/92	10/26/93	3/13/96	6/5/96	3/26/97
Parameters					
Chloroethane	NR	NR	NR	NR	269
1,1-Dichloroethene	NR	NR	NR	NR	14,400
Methylene Chloride	NR	NR	2,890	4,980	3,940
Acetone	NR	NR	NR	NR	2,590
1,1-Dichloroethane	NR	NR	NR	NR	17,400
2,2-Dichloropropane	NR	NR	NR	NR	192
1,1,1-Trichloroethane	270,000*	44,000	14,200	30,400	12,600
2-Butanone (MEK)	NR	NR	NR	NR	3,950
Trichloroethene	NR	NR	230	<1,300	840
Toluene	NR	NR	NR	NR	126

Concentrations in ppb
NR - Not reported
*Approximate value; concentration outside calibration range.

These data indicate that trapped water beneath the building floor has been impacted by VOCs. This observed impact may be related to historical releases in this area; however, it does not appear that soil in this area has been significantly impacted. VOC concentrations in the trapped water exceed the VOC concentrations in the soil for the majority of the samples collected from this area.

5.0 Preliminary Assessment Report - Prepared by Jacobs Engineering for the USEPA Dated September, 1992

Jacobs Engineering (Jacobs) conducted a Visual Site Inspection (VSI) and a Preliminary Assessment (PA) of the Site on March 4, 1992. The VSI/PA was summarized in a report dated September, 1992. This report identified 35 Solid Waste Management Units (SWMUs) and four Areas of Concern (AOC).

6.0 MDNR Division of Environmental Quality Hazardous Waste Program Site Sampling Report - Cover Letter Dated March 2, 1993 From Julie A. Bloss Environmental Specialist

The former Sundstrand Tubular Products site was the subject of a preliminary assessment/site inspection (PA/SI) investigation. The MDNR, Hazardous Waste Program (HWP), Superfund Section, completed a preliminary assessment report and a site inspection sampling report at this Site. The Site Sampling Report was prepared by the Environmental Services Program (ESP) of the MDNR.

Field work for this activity was conducted from July 20 through July 31, 1992. The purpose of the investigation was to determine whether hazardous substance releases from the Sundstrand Tubular Products facility (presently Modine Heat Transfer) has caused groundwater contamination in the area. Previous sampling conducted by Modine contractors indicated that soil around the Site exhibited concentrations of TCE, TCA, PCE and vinyl chloride.

Two monitoring wells (MW-1 and MW-2) were drilled and sampled during the site inspection. Monitoring well MW-1 was drilled southwest of the facility visitor parking lot a location considered downgradient of the facility. Monitoring well MW-2 was drilled near the northeast side of the facility at a location considered to be upgradient of the facility. The monitoring well locations are depicted on Figure 4. The results of the drilling indicated low levels of TCE in the soil cuttings from monitoring well MW-2 at depths of 5 to 5.5 feet below ground surface (bgs), 15 to 16 feet bgs, and 20 to 22 feet bgs. However, no TCE or other VOCs were detected in the groundwater taken from the two wells.

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Two grab samples were collected of surface water bodies near the Site. A small creek, which flows through Jarvis Hollow (just below MW-1) and Ha Ha Tonka Spring, which flows into the Lake of the Ozarks approximately 2½ to 4½ miles south of the Site, were sampled. No VOCS were detected in these surface water samples.

Modine collected a split of the groundwater sample from MW-2. According to the Modine analysis the sample split from MW-2 contained no TCE concentrations above the detection level used by the MDNR laboratory. Modine did not split the groundwater sample from MW-1.

Based upon these results, the Superfund Section concluded that no further action was necessary at the Camdenton Site at that time.

7.0 Revised Environmental Site Assessment - Law Environmental Report Dated August, 1993

As previously stated, Sundstrand submitted a Closure Plan in September, 1990 to terminate its interim status and hold generator status only. On February 14, 1992, Modine submitted a Revised Closure Plan for the tank and drum storage areas to the MDNR. In November, 1992, MDNR approved the closure plan with some modifications. In March, 1993, Modine and MDNR reached a negotiated settlement with regard to the Closure Plan modifications. The Closure Plan modifications included the collection of soil and wipe samples.

The purpose of this proposed sampling effort was to:

- Evaluate soils near the aforementioned tank and drum storage areas along the west side of the facility for the presence of halogenated VOCs and total cadmium, chromium, nickel, lead, silver, and cyanide.

- Evaluate the interior tank and drum storage paved surface by collecting a wet mop (wipe) sample from the storage surface and analyze it for the same compounds as for the soil samples.

Six soil borings were drilled in the vicinity of the tank and drum storage areas located on the west side of the manufacturing plant, and one background boring was drilled on the northeast corner of the plant. Figure 5 illustrates these boring locations. Three soil borings were drilled around previously drilled soil boring B-2 which is believed to have been the tank and drum storage area from 1983 to 1985, and three soil borings were drilled just east of previously drilled B-1, which is believed to have been just outside the tank and drum storage area from 1985 to 1990.

On July 8, 1993, sampling was conducted on the floor of the inside tank and drum storage area. The sample was an eight aliquot composite wipe sample. Two 10 by 18 foot gridded areas were laid out on the floor of the area in a manner which fit the available space. Drum storage racks and several ASTs containing chemicals for use in the Modine facility were present in the area. Four, one-square foot units were selected using a random number generator to identify location coordinates from each 10 foot by 18 foot grid. Eight, one-foot squares were sampled using laboratory prepared wipes for the requested analyses. Each wipe was used to sample each of the eight aliquots.

Six compounds were detected in the soil samples collected near the tank and drum storage pads. These compounds included: cadmium, chromium, lead, nickel, vinyl chloride, and trans-1,2 dichloroethene. The same six compounds were detected in the wipe samples collected from the floor surface of the interior tank and drum storage areas. The ASLs were exceeded only by the lead concentration in the soil sample from boring B-11 from a depth of 0 to 2 feet.

8.0 Environmental Risk Assessment of Former Drum Storage Areas - Law Environmental Report Dated August 16, 1994

Law Environmental performed a risk assessment, which was summarized in a report dated August 16, 1994. The Risk Assessment presented the following conclusions:

- Some VOCs were detected in soil around former drum storage Areas 1 and 2 at the Modine plant. Possible complete exposure pathways were generally limited to on-site workers potentially engaged in excavation activities in Areas 1 and 2; however, even if

excavation occurs in these areas, no adverse human health impacts are expected based on the low levels of constituents. With respect to potential air exposures during possible future excavation work in Areas 1 and 2, no VOC vapors have been detected in the breathing zone during standard health and safety monitoring conducted as part of investigative efforts in these areas.

- The only non-VOC potential constituent of concern detected in soil at the Site was lead. However, due to (1) its anomalous elevated occurrence in only one sample, (2) the fact that lead is not and has not been used in manufacturing at the Site, and (3) the known occurrence of lead ore in Camden County and surrounding area (Wharton, 1985 and Rueff, 1988); lead is not considered to be a significant risk-based constituent of concern at the Site. The singular elevated occurrence of lead is suspect based on the rest of the database at the Site and suggests that the sample may have contained a minute chip of lead ore perhaps, brought in with fill material used at the Site.

The results of this study indicated that: no health risk was posed by the minimal amounts of VOCs in the soil, and that lead in soil was not considered a significant risk-based constituent. The assessment concluded that further soil remediation was not necessary based upon risk.

9.0 Miscellaneous Events and Site Investigations

9.1 1991 TCA Spill

A spill of TCA occurred in early 1991 from the monorail degreaser in the southern portion of the plant (SWMU#26). This is the same area investigated by Law in 1991. It was estimated that 1,675 gallons had spilled into the machine pit/containment sump. Plant personnel recovered 1,469 gallons using a vacuum system. The estimated loss of approximately 206 gallons was primarily attributable to volatilization.

9.2 MDNR RCRA Sampling Investigation

The MDNR conducted a RCRA sampling investigation on December 7, 1994. The purpose of the investigation was to sample the two on-site monitoring wells. Analytical results were as follows: the groundwater sample from MW-1 exhibited a TCE concentration of 6.9 ppb, and the groundwater sample from MW-2 exhibited a TCE concentration of below the detection limit of 5 ppb. The duplicate sample from MW-2 exhibited a TCE concentration of 5.1 ppb. Modine

provided bottles for collection and analysis of a split sample. Results obtained on the split samples were 6.1 ppb TCE in the groundwater sample from MW-1 and below detectable levels (less than 5 ppb) in the groundwater sample from MW-2.

9.3 February 1995 Groundwater Sampling Event

Law Environmental sampled the two on-site monitoring wells on February 23, 1995, for Modine. The results from this sampling event indicated TCE concentrations below the Drinking Water Maximum Contaminant Level (MCL) of 5 ppb in the groundwater sample from MW-1 and both the original and duplicate groundwater sample from MW-2.

10.0 Findings of an Investigation to Achieve Final Closure of the Interim TSD Facility Located at the Modine Heat Transfer, Inc. Site Camdenton, Missouri - Dames & Moore Report Dated February 5, 1996

Dames & Moore conducted a soil and groundwater investigation in August, 1995 that included a quarterly sampling event conducted in November, 1995. The purpose of this investigation was to further define the extent of contamination, further assess the impact to groundwater, and attempt to obtain sufficient data to achieve final closure of the interim TSD facility at the Site. This investigation included: advancement of six soil borings, installation of two monitoring wells, collection of soil and groundwater samples, and removal of the impacted soil in the area of elevated lead concentrations identified by Law in their 1993 investigation. A summary of each of these activities is provided in the following paragraphs.

10.1 Excavation of Lead-Impacted Soil

Lead-impacted soil was identified in the area of boring B-11 during the Revised Environmental Site Assessment conducted by Law in July, 1993. Lead is not identified as a constituent previously stored or used at the facility; however, MDNR requested that the issue of elevated lead concentrations be addressed. Due to the shallowness of the elevated lead concentration (0 to 2 feet bgs), excavation and disposal of the impacted soil near B-11 was the most efficient way to resolve the issue.

Prior to excavating the impacted area, a composite sample was collected from 0 to 3 feet bgs for disposal profiling. The sample was analyzed for Toxicity Characteristic Leaching Procedure (TCLP) metals, corrosivity, and free liquids to determine if the soil was characteristically hazardous. The results of the tests indicated that the soil was not characteristically hazardous; therefore, excavated soil was disposed as special waste.

Approximately 12 cubic yards of soil were removed from the impacted area. The soil was hauled for disposal at the Laidlaw Waste System, Inc. (Laidlaw) operated landfill in Jefferson City, Missouri. Once the soil was removed, a sample was collected from the base and all four walls of the excavation. The following lead concentrations were detected above the reporting limit:

- north wall 59.4 ppm
- east wall 45.9 ppm
- west wall 90.0 ppm
- south wall 57.6 ppm
- base 87.7 ppm.

These concentrations are below the background lead level of 238 ppm derived from a sample from background boring B-5 in the previous Law investigation and below the ASL of 240 ppm.

10.2 Soil Boring Advancement and Soil Sampling

The purpose of the advancement and sampling of soil borings was to assess the extent of the VOC contamination previously identified. The MDNR Hazardous Waste Program (HWP) requires the determination of rate of transport and extent of impact for closure of TSD facilities.

A total of six soil borings were advanced at the facility. The soil boring locations are shown on Figure 6. Soil samples were continuously collected from all borings. The depths of the soil borings ranged from approximately 4.5 feet to 13 feet bgs. All of the borings were advanced until auger refusal was encountered.

A photoionization detector (PID) was used to take the headspace readings for the purpose of field screening the soil samples. Soil samples submitted to the laboratory were selected for submittal based on headspace PID readings. The intent was to select samples exhibiting no detectable VOCs from the greatest depths at locations furthest from the potential source. Samples were submitted

to the laboratory for analysis from three of the six soil borings advanced at the Site. The sample depths ranged from 6 inches to 13 feet bgs. The following soil samples were selected for submittal to the analytical laboratory for VOC analysis: B-13 at 8.5 feet to 13 feet bgs, B-16 at 6" 0.5 feet to 4.5 feet bgs, and B-17 (MW-3) at 4.5 feet bgs. The analytical results for these samples are presented below:

- The soil sample collected from soil boring B-13 at a depth of 8.5 feet to 13 feet bgs was collected along the former drain line on the west side of the building and exhibited a field PID reading of 787 ppm (in isobutylene equivalents). VOCs reported at concentrations above the reporting limit were TCE at 204 ppm and PCE at 2.18 ppm.

- The soil sample collected from soil boring B-16 at a depth of 6 inches to 4.5 feet bgs exhibited a field PID reading of less than 1 ppm. The following VOCs were reported at concentrations above the reporting limit: 1,1-DCE at 0.0109 ppm, TCE at 0.0289 ppm, and methylene chloride at 0.029 ppm.

- The soil sample collected from soil boring B-17 (MW-3) at a depth of 4.5 feet bgs exhibited a field PID reading of less than 1 ppm. The following VOCs were reported in concentrations above the reporting limit: TCE at 0.0035 ppm and methylene chloride at 0.013 ppm.

10.3 Monitoring Well Installation and Groundwater Sampling

A Revised Work Plan was submitted to and approved by the MDNR in June, 1995. The Work Plan proposed the installation of one monitoring well in the assumed downgradient direction (southwest). The purpose of the monitoring well was to aid in the determination of groundwater flow direction and to provide an additional sampling point for chemical analysis of the groundwater. Monitoring well MW-3 was installed in the south central portion of the subject property. The well was completed and its casing elevation was surveyed. The water level was gauged and the groundwater flow direction was determined to be in a northwesterly direction. This flow direction indicated that MW-3 was not located downgradient of the facility and former drum storage areas; therefore, an additional monitoring well (MW-4) was installed northwest of the facility and the former drum storage areas.

Five inch diameter, Schedule 40 steel threaded surface casing was installed 8 (MW-3) to 10.5 (MW-4) feet into the competent bedrock. In MW-3, 64 feet of casing was installed and in MW-4,

44 feet of casing was installed. The wells were completed open hole to total depth under variance number 00322.

Groundwater sampling was conducted for all four of the monitoring wells after installation of MW-3 and MW-4. Prior to sampling, the wells were gauged to assess groundwater levels and were adequately purged. Analytical results from the initial sampling event are discussed below:

- MW-1: The only VOC detected above the reporting limit was TCE at a concentration of 11.8 ppb.
- MW-2: No VOCs were detected above the reporting limit of 5 ppb in the sample or duplicate sample collected from MW-2.
- MW-3: The only VOC detected above the reporting limit was TCE at a concentration of 8.0 ppb.
- MW-4: The only VOC detected above the reporting limit was TCE at a concentration of 88.9 ppb.

The results from the November quarterly sampling event are discussed in Section 11.0 of this report.

10.4 Conclusions

Conclusions drawn from the results of this investigation are as follows:

- Analysis of the soil samples collected from the excavation at the lead impacted area indicated that a sufficient volume of soil was removed to adequately remediate the lead impact to soil in this area.
- Results from the analysis of the soil samples collected from the soil borings indicated that VOC-impacted soil exists along the storm water drain line. The TCE concentration in the subsurface soil sample from near the drain line exceeded 200 ppm. This concentration is below the ASL for TCE of 260 ppm. PCE and 1,1-dichloroethene were also present in some of the soil samples at concentrations well below the corresponding ASLs.
- The effort to assess the extent of the VOC impact to site soil was not successful. Field indications based upon PID readings indicated no impact in borings B-16 and B-17;

however, laboratory analytical results indicated TCE present in both samples. The TCE concentration of 0.0035 ppm in the sample from B-17 was only slightly above the detection limit.

- Methylene chloride was reportedly present in two of the three samples collected. Based upon the presence of methylene chloride in the method blank and the fact that methylene chloride is a common laboratory reagent, Dames & Moore believes that the reported methylene chloride in the samples is due to laboratory introduction and is not actually present in the samples.

- The groundwater samples collected were analyzed for the full suite of VOCs. The only VOC present in the samples above the reporting levels was TCE. During the initial sampling event, TCE was detected above the 5.0 ppb reporting level in MW-1, MW-3, and MW-4.

- The groundwater movement through the dolomite bedrock is via secondary porosity such as fractures and solution channeling. The potentiometric surface map presented as Figure 7 indicates a trough-like configuration with MW-1 being the downgradient well located approximately in the center of the trough-like surface.

11.0 Quarterly Sampling Events - Dames & Moore Letter Reports Submitted Quarterly

In accordance with the approved Work Plan, quarterly sampling was conducted for a period of two years. Wells that exhibited TCE results below the 5 ppb reporting limit for three consecutive sampling events were eliminated from the monitoring program. Results for the sampling events from August, 1995 through June, 1997 are presented in the following table:

QUARTERLY MONITORING TCE CONCENTRATIONS

Well ID	8/95	11/95	2/96	5/96	8/96	12/96	3/97	6/97
MW-1	11.8	9.4	ND (Dup. 5.4)	ND	ND	ND (Dup. ND)	NT	NT
MW-2	ND (Dup. ND)	ND	ND	ND	NT	NT	NT	NT
MW-3	8.0	ND	6.6	ND	ND (Dup. ND)	NS	ND*	NT
MW-4	88.9	142 (Dup. 154)	173.0	10.0	NS	NS	34* (Dup. 37)	120

Concentrations ppb

NT - Not Tested

ND - Not Detected at or above 5 ppb

NS - Not Sampled due to insufficient volume

* - Wells MW-3 and MW-4 were deepened in 2/97

The results from the quarterly sampling indicate that only groundwater samples from MW-4 are consistently above the 5 ppb MCL for TCE. The quarterly sampling results also indicate that no other VOCs have been detected in the groundwater beneath the site.

12.0 Final Report of Fracture System Investigation - Dames & Moore Report Dated July 17, 1996

A field fracture survey was conducted on May 15 and May 16, 1996. For the field fracture survey, a reconnaissance was performed of areas surrounding the Subject Property, which were likely to have outcrops. Observed outcrops were inspected for the presence of fractures and the orientations (strike and dip) of these features were measured. In addition, field notes were taken as to the lithology of the rock, as well as other observations pertaining to the fractures, including:

- Nature of the fractures (open or tight);
- Whether or not the fractures were solution enlarged;
- Presence and nature of secondary minerals;
- Presence or absence of water seepage;
- Presence or absence of apparent offset across the fracture; and
- Any other pertinent observations.

A significant number of outcrop areas were located as illustrated on Figure 8. Most of the outcrop areas occurred on the steep portions of hills, in small surface drainage on hillsides, or along creeks. However, no outcrops were located in topographically flat areas. Therefore, fracture orientations were measured to the north, west, and south of the Subject Property. No orientations could be measured to the east of the Subject Property, due to the lack of outcrops in this area.

The orientations of 173 fractures were measured from 20 outcrop areas. In addition, 19 measurements of the orientation of bedding features were performed. All orientation measurement were taken with Brunton® compasses, which had previously been adjusted to compensate for magnetic declination. Fractures were encountered in two primary rock types, dolomite and chert. The dolomites encountered were primarily light gray in color, crystalline, and commonly contained fossil fragments. Solution features, such as pits and voids, were common and the majority of the fractures had been widened by solution activity. However, much of the solution widening may have been a near-surface phenomenon due to weathering. Cherts were predominantly white to light gray and were often strongly banded. Fractures in chert were

generally tight with no solution widening. No substantial seepage from any of these fractures was observed.

These fracture orientations were plotted on a contour diagram, using stereographic projection. The following conclusions were drawn from this study.

- The vast majority of all of the fractures are vertical or nearly vertical. The data demonstrates that only 5 of the 173 fractures were oriented at less than 75° from horizontal. Only one fracture was oriented less than 45° from horizontal.

- One strongly preferred orientation is apparent from the data set, represented by poles which plot in the northwest and southeast quadrants of a contour diagram. The orientations of the fractures which are represented by these poles are nearly vertical and trend overall N 50° E.

- A subordinate preferred orientation is represented by poles which plot in the northeast and southwest quadrants. The orientations of the fractures which are represented by these poles are again nearly vertical and trend overall N 70° W.

Preferred fracture orientations were also plotted on a circular histogram. The histogram demonstrated the overwhelming preponderance of fracture orientations which occur at approximately N 50° E. The diagram also shows the secondary fracture direction of approximately N 70° W. Figure 9 shows the preferred orientations for fractures as plotted at the location of MW-4. The primary preferred direction of fracturing is not consistent with an on-site source for impacted groundwater.

12.1 Geophysical Logging

Geophysical logging of all four wells on the Subject Property was accomplished on May 20, 1996 in the presence of Dr. J. Ronald Sides and three representatives of the MDNR; Mr. Gene Williams, Mr. R. Bruce Stuart, and Ms. Darleen Wescott. The results of the logging are summarized below. All depths discussed in this section are depth below top of casing.

In all logs, rock beneath the casing is shown to be fairly high in resistivity, which is consistent with carbonate rock, and fairly uniform. Both the resistivity and the gamma ray curves do not support major changes in lithology. However, a conspicuous gamma ray peak, which corresponds

to a resistivity low, is present in all of the wells. The nature of this feature, referred to as the "gamma marker" in this report, is unknown. The log signature is consistent with a clay or shale, but other interpretations are possible. An alternative possible lithology would be a tight (nonporous), clay-rich, sandstone or siltstone. However, sandstones or siltstones have not been identified from boring logs. The gamma marker occurs at 130 feet in MW-1, 143 feet in MW-2, 127.5 feet in MW-3, and 130 feet in MW-4. The marker is approximately three feet thick in MW-1 and MW-2, about four feet thick in MW-3 and only approximately one foot thick in MW-4.

12.2 Hydrogeologic Interpretation

The field fracture survey and geophysical logging have resulted in the following hydrogeological interpretations.

As part of the field fracture survey, the strike and dip of bedding features was measured at 19 locations. These orientations indicated that the bedrock dip is generally very low, with no measured dip of more than eight degrees from horizontal. The azimuth of the measured dip angles varies considerably and no clearly preferred orientation is evident from the data. Lack of consistent dip in the Rubidoux Formation may be related to solution features in the underlying Gasconade Formation.

Geophysical logging supports the low dip of the strata. Plotting the elevation of the gamma marker indicates this surface is gently dipping at a rate of approximately 0.02 feet per foot or less (approximately 1.1 degrees or less) and exhibits a trough-like surface. This surface is lowest for well MW-1 and is highest for MW-3. This surface resembles the groundwater surface, which has been measured for these wells.

Of the logging tools which were run, the density tool has the greatest resolution relative to fractures in the subsurface. For MW-1 and MW-2, only the neutron log could be run and only small intervals of these wells could be logged by this tool. Therefore, fracture density was reviewed for only MW-3 and MW-4. These logs indicate numerous sharp peaks of lower density (higher apparent porosity). Most of these sharp peaks correspond to similar peaks on the neutron log, suggesting that they correspond to real structural features. These sharp peaks are interpreted as indicating fractures or voids in the rock, since the resistivity traces do not support rapid

lithologic changes. Using a criteria that identifies fractures as those peaks which rose more than 0.2 grams per cubic centimeter off of local density background the following results were obtained:

- MW-3 - 21 fractures were indicated over a log interval of 95 feet (2.2 fractures per 10 foot interval)
- MW-4 - 24 fractures were indicated over an interval of 114 feet (2.1 fractures per 10 foot interval).

Therefore, the vertical fracture density for these two wells is very similar and no systematic variations in fracture density are implied.

12.3 Implications for Hydrogeology

The results of the field fracture survey and geophysical logging suggest important implications for the hydrogeology beneath the Subject Property. Groundwater beneath the Subject Property is substantially deep, ranging from 149.07 feet below casing (MW-1) to 161.45 feet below casing (MW-2) for the November, 1995 sampling event. The average terrain of the Subject Property is approximately 160 to 170 feet above the surrounding valley floors, so that most of the groundwater transport down to the level of the surrounding valley floors is in the unsaturated zone. Transport mechanisms will be substantially different for the saturated zone versus the unsaturated zone. These transport mechanisms are discussed separately in the following subsections.

12.3.1 Unsaturated Zone Transport

The primary direction of transport in the unsaturated zone will be vertically downward, and the primary mechanism will be through fractures in the dolomite, since the formation has little to no primary porosity. This direction of transport will be modified by several mechanisms, including the directional nature of the fractures, bedding surfaces, and possibly the soil/rock interface.

The preferred fracture flow direction is N 50° E with a secondary fracture direction of approximately N 70° W. These orientations indicate little potential for impacted groundwater to migrate to MW-4 from the bulk of the Subject Property, based solely on fracture orientations.

Some modification of the downward direction of groundwater movement may arise due to the presence of bedding features, and fluids may move alternately along bedding plane features and vertical fractures as they migrate generally downward. However, the elevation of the gamma marker demonstrates that bedding features would tend to move groundwater toward MW-1 and not MW-4, beneath the Subject Property.

It is also possible that groundwater could become temporarily perched along the soil/rock interface and move horizontally for some distance before passing downward into the rock. However, inspection of the estimated top of rock elevation suggests that groundwater beneath the Subject Property would move westward, toward MW-1, and not toward MW-4.

12.3.2 Saturated Zone Transport

Upon reaching the saturated zone, the direction of transport will change abruptly to follow the regional potentiometric surface. Regional groundwater flow is expected to be to the west or southwest, toward Lake of the Ozarks, which probably represents regional base level. The potentiometric surfaces which have been mapped, have indicated a direction of groundwater flow toward MW-1 and not MW-4. However, the direction of groundwater flow can be strongly influenced by preferential pathways within the rock. In this case, the direction of flow beneath the Subject Property is expected to be substantially influenced by the strong preferred fracture orientation of N 50° E (northeast-southwest).

12.4 Conclusions

To summarize the results of the Fracture System Investigation, none of the fracture or bedding-involved fluid flow mechanisms are consistent with impact of groundwater at MW-4, from an on-site source. In Figure 9, the observed preferred fracture directions have been superimposed on a topographic map. It can be seen that the preferred fracture direction trends directly toward the city operated lagoon located northeast of Modine. If the lagoon has acted as a receptor for TCE in the past, the possibility exists that TCE is migrating onto the Modine facility through the vertical fractures located within the subsurface.

13.0 Subsurface Investigation Former Hulett Lagoon - Dames & Moore Letter Report Dated November 4, 1996

The former city owned and operated lagoon.is located approximately 1,000 feet northeast of the Modine Heat Transfer facility. Based upon the results of the field fracture survey, the former lagoon is strongly indicated as the source of the observed TCE impact to groundwater at the Modine facility. The purpose of this investigation was to determine the presence or absence of VOCs, in particular TCE, in soil underlying the former Hulett Lagoon.

The field investigation was conducted on October 11, 1996. Four hydraulically driven probes were advanced in the area of the lagoon in which an inlet pipe from the City of Camdenton sanitary sewer system and an outlet or discharge pipe from the lagoon were previously located. Figure 10 illustrates the probe locations. The probes were continuously sampled and field screened using a photoionization detector (PID). The soil sample exhibiting the highest indication of VOC content from each probe was analyzed for VOCs, with TCE as the primary constituent of concern.

The analytical results are presented in the table below:

Sample Location	Depth (ft)	Chloroform	cis-1,2-Dichloroethene	TCE
GP-1	4-6	0.200	ND	9.170
GP-2	4-5.5	ND	ND	1.940
GP-3	4-5	0.0094	0.0914	ND
GP-4	4-6	ND	ND	ND

Concentrations in ppm
ND - Not detected above the laboratory reporting limit

The TCE concentrations encountered in the soil beneath the former lagoon supports the position of an off-site source for the observed TCE impact to groundwater at the Modine facility This analytical data and the geological data resulting from the field fracture survey strongly suggests that the former lagoon is the off-site source. It should be noted that this investigation was of limited scope and that substantially higher VOC concentrations may exists in soil beneath unsampled areas of the former lagoon.

14.0 Subsurface Investigation Monorail Vapor Degreaser and Still M567 (SWMU 26) and Former Drum Storage Area Number 3 (SWMU 31) - Dames & Moore Letter Report Dated May 16, 1997

This subsurface investigation focused on an area surrounding the monorail vapor degreaser and still M567 located in the southern portion of the facility building. This degreaser and associated still were identified as SWMU#26 in the PA Report prepared by Jacobs. This same area was formerly identified in the Jacobs report as SWMU#31.

In the past, trapped water within the gravel subgrade, has been collected at a sampling port (pit trap) in the bottom of the monorail vapor degreaser concrete-lined trough. These trapped water samples indicate the presence of VOCs. Refer to Section 4.0 of this report for a summary of previous results. The purpose of this investigation was to assess the potential for a soil impact to exist beneath this degreaser.

The subsurface investigation was conducted on April 21 and 22, 1997. A total of ten probes were advanced in the vicinity of the monorail vapor degreaser. The probes were located as follows: three along the north side, four along the south side, and one at each end of the east-west trending, 65-foot long, concrete lined, degreaser trough. The probe locations are illustrated on Figure 11.

Soil samples were continuously collected utilizing a four-foot long, two-inch diameter continuous core sampler. All of the probes were advanced to bedrock at depths ranging from 3½ feet to 17 feet bgs. A PID was used to take the headspace readings for approximating volatile organic content in the soil samples.

Two soil samples were selected for submittal to an off-site analytical laboratory from each probe with the exception of P-6 and P-8. Only one soil sample was collected and submitted from P-6 due to the shallow depth at which bedrock was encountered. A soil sample was not submitted from P-8 because no sample could be recovered. In probes P-1 and P-10 the soil samples selected for analysis were taken at greatest depth, 16 to 17 feet bgs and 8 to 11 feet bgs, respectively and at the highest PID or olfactory indication of impact, 8 to 12 feet bgs and 4 to 8 feet bgs, respectively. In the remaining probes, soil samples were submitted from each sample acquisition due to the shallow depth of bedrock encountered. The results obtained for the soil samples

indicate that no VOCs exceeded corresponding ASLs. Analytical results are summarized in the following table:

Probe ID	Depth	Methylene Chloride	Acetone	1,1-DCE	1,1-DCA	Total 1,2-DCE	1,1,1-TCA	TCE	PCE
P-1	8-12'	0.012	0.022	ND	ND	0.050	ND	0.086	ND
P-1	16-17'	0.006	ND	ND	ND	ND	ND	0.006	ND
P-2	10"-4'	0.009	0.076	ND	ND	ND	ND	ND	ND
P-2	4-6'	ND	0.020	ND	ND	ND	ND	ND	ND
P-3	10"-4'	0.005	0.027	ND	ND	ND	ND	ND	ND
P-3	4-5.5'	ND	0.012	ND	ND	ND	ND	ND	ND
P-4	10"-4'	ND	0.012	ND	ND	ND	ND	0.048	ND
P-4	4-6'	0.016 B	0.045	ND	ND	ND	ND	0.010	ND
P-5	0-4'	0.026	ND	ND	ND	ND	ND	ND	ND
P-5	6-7.5'	0.052	0.025	0.007	0.006	ND	ND	0.050	ND
P-6	5"-3.5'	0.05 B	0.043	ND	ND	ND	0.024	0.008	ND
P-7	4'	0.11 B	0.120	0.03	0.079	0.096	1.8	4.0	0.014
P-7	4.5-5.5'	ND	ND	0.77	ND	ND	6.0	3.4	ND
P-9	0-4'	0.030 B	ND	ND	ND	ND	ND	0.008	ND
P-9	4-7'	0.044 B	ND	ND	ND	ND	0.011	0.014	ND
P-10	4-8'	ND	ND	ND	ND	0.024	ND	0.080	ND
P-10	8-11'	0.051 B	0.050	ND	ND	0.018	ND	0.066	ND
ASL	-	670	5,600	8.3	NA	1,660	2,000	260	380

Concentrations in ppm

ND - Not detected above reporting limit
B - Analyte detected in method blank
NA - Not Available

Soil analytical results indicated the highest VOC concentrations in the vicinity of P-7, approximately seven feet east of the former 1,000 gallon TCA above ground storage tank and approximately three feet north of the monorail vapor degreaser. However, the soil samples collected from all probes exhibited VOC concentration below the associated ASLs.

Trapped water was encountered in two of the probes, P-8 and P-9. A water sample was not collected from P-8, due to the probe hole caving. The caving was caused by the abundant gravel encountered at this location. An offset probe, P-9, was located approximately two feet east of P-8. A sample of this trapped water was collected. Dames & Moore also collected a sample of the trapped water from the sample port (pit trap) in the base of the monorail vapor degreaser concrete lined trough. The results obtained for the water samples are summarized in the following table:

Sample ID	Methylene Chloride	Acetone	1,1-DCE	1,1-DCA	Total 1,2-DCE	1,2-DCA	2-Butanone	1,1,1-TCA	TCE
Pit Trap	3,300	2,200	22,000	17,000	ND	550	2,000	21,000	1,300
P-9	260	38	590	63	160	ND	ND	250	850
MCL	NA	NA	7	NA	170	5	NA	200	5

Concentrations in ppb

ND - Not detected above reporting limit
MCL - Maximum Contaminant Level
NA - Not Available

The trapped water beneath the building within the gravel subgrade exhibited some VOC concentrations in excess of MCLs. The MCLs were exceeded for 1,1-DCE, 1,2-DCA, 1,1,1-TCA, and TCE in the sample from the pit trap and for 1,1-DCE, 1,1,1-TCA, and TCE in the water sample from P-9.

Due to the location of the degreaser trough, the low levels of VOCs in the soil, and the capped nature of the SWMU's in question, no further investigative or remedial activity has been conducted in this area. Excavation of the areas was considered; however, upon further review it appears that any excavation will affect the structural integrity of the surrounding building columns, footing, and other structural members, causing an unstable and potentially dangerous situation.

The monorail vapor degreaser was removed from the facility following the investigation. The area was brought to grade (the degreaser trough was filled in), capped with a concrete layer, and equipment was installed in this area for future production.

15.0 Subsurface Investigation, Out of Service Mud Pit Locations - Dames & Moore Letter Report Dated October 9, 1997

A subsurface investigation was conducted on September 3, 1997. This subsurface investigation focused on the area surrounding three mud pits at the facility. These three mud pits, plus one that was previously removed, were collectively identified as SWMU#2 in the PA Report prepared by Jacobs.

The three mud pits still present at the facility were taken out of service approximately 12 years ago. The mud pits are located west of the manufacturing facility beginning at the scrap-metal bins in the south and extended north to beneath the pretreatment/drum storage area. Each mud pit consists of a 4 foot-by 4 foot-cement sump approximately 4 feet in depth. The mud pits were in operation from 1967 to 1986. The mud pits were connected by a 6-inch steel line that delivered storm water; boiler blowdown water; and chrome, copper, and aluminum cleaning line wastewaters from the manufacturing process. Each sump received the previous sump's wastes until the wastewater was discharged into the sewer. Wastewater progression went from pit #4 to pit #1. The mud pits collectively discharged wastewater into a combined sewer line operated by the City of Camdenton. The sewer line reportedly discharged directly to the off-site Hulett Lagoon.

The purpose of this subsurface investigation was to determine the presence, if any, of VOCs and total RCRA metals in the soil in the vicinity of the out-of-service mud pits. A total of ten probes were advanced at the facility. Eight probes were advanced in the vicinity of the out-of-service mud pits and two additional probes were advanced north of the mud pits along the sewer line formerly discharging to the City of Camdenton sanitary sewer system. The probes were located as follows:

Probe	Location
P-1	Approximately 4.5 feet north of mud pit #1.
P-2	Approximately one foot west of mud pit #1.
P-3	Northeast corner of mud pit #1.
P-4	Approximately one foot north of mud pit #3 on the northeast corner.
P-5	Approximately 2.5 feet west of mud pit #3.
P-6	Approximately 26 feet south of mud pit #3 and 19 feet north of mud pit #4.
P-7	Approximately one foot west of mud pit #4.

P-8	Approximately two feet south of mud pit #3.
P-9	Approximately 32 feet north of mud pit #1 along sewer line.
P-10	Approximately 99.5 feet north of P-9 along sewer line.

The probe locations are illustrated on Figure 12.

Soil samples were continuously collected utilizing a four-foot long, two-inch diameter continuous core sampler. The probes were advanced to depths ranging from four to 10 feet bgs. Headspace readings were measured with a PID to approximate organic constituent concentrations in soil headspace vapor.

One soil sample from each probe was selected for submittal to an off-site analytical laboratory, with the exception of P-5 and P-10. Soil samples from these probes were not submitted to an off-site laboratory for analytical results due to field observations that indicated no impact (no PID readings above background levels). The soil samples selected for analysis from the other eight probes were taken at the highest PID or olfactory indication of impact.

The results obtained for the soil samples indicate that no VOCs exceeded corresponding ASLs. Analytical results for VOCs are summarized in the following table:

Sample ID	Depth	cis-1,2-DCE	Naphthalene	1,2,3-Trichlolobenzene	TCE	Xylene	2-Butanone
P-1	8-10	0.0770	0.0040	0.0030	0.0590	ND	ND
P-2	0-4	0.0040	ND	ND	0.0700	ND	ND
P-3	4-7	ND	ND	ND	0.0030	ND	ND
P-4	8-10	0.0690	ND	ND	0.1910	ND	ND
P-6	4-8	0.0150	ND	ND	0.9000	0.0020	ND
P-7	0-4	0.0140	ND	ND	0.0180	ND	0.0120
P-8	0-4	0.0210	ND	ND	0.0320	ND	ND
P-9	4-6	0.1080	ND	ND	0.1230	ND	ND
ASL	-	560	230	-	260	110,000	1,400

Concentrations in ppm
ND - Not detected above the laboratory reporting limit

The results obtained for the soil samples analyzed for total RCRA metals indicated that lead is present in probes P-1, P-4, and P-9 in excess of the corresponding ASL of 240 ppm. The metals results are summarized in the following table:

Sample ID	Depth	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury
P-1	8-10	4.77	60.6	ND	13.1	563.0	0.28
P-2	0-4	3.16	51.7	ND	8.48	20.3	ND
P-3	4-7	2.86	30.5	ND	61.9	27.0	ND
P-4	8-10	8.98	104	ND	18.0	1,240	0.23
P-6	4-8	7.69	21.3	ND	30.4	146.0	ND
P-7	0-4	6.36	85.0	ND	15.6	20.2	ND
P-8	0-4	5.22	76.9	ND	12.7	35.7	ND
P-9	4-6	6.51	226.0	2.30	21.8	314.0	0.81
ASL	-	11	3,900	28	5,600	240	17

Concentrations in ppm
ND - Not detected above the laboratory reporting limit

Probe P-1 is located approximately 4.5 feet north of mud pit #1, Probe P-4 is located approximately one foot north of mud pit #3 near the northeast corner, and Probe P-9 is located approximately 32 feet north of mud pit #1 along the discharge line to the sanitary sewer.

Based upon these analytical results, over excavation during the scheduled removal of the out-of-service mud pits was recommended.

16.0 Excavation of Out of Service Mud Pits - Dames & Moore Letter Report Dated December 1, 1997

Mud pits #1, #3, and #4 and the area surrounding former probe P-9, along the discharge line north of mud pit #1, were excavated on October 2, 1997. Confirmatory soil samples were collected from the walls and base of each excavation area. A Site Plan illustrating both the mud pit excavations and the excavation near former probe P-9 is included as Figure 13.

16.1 Former Probe P-9 and Mud Pit #1 Excavation

The excavation in the area surrounding former probe P-9 was completed to a depth of approximately seven feet bgs to ensure that locally impacted soil was removed. Upon completion of the excavation in the area of P-9 a confirmatory soil sample, E-1, was collected from the base of the excavation. The excavation was then advanced in a southerly direction towards mud pit #1, maintaining a depth of approximately seven feet bgs. The excavation was adjacent to the current discharge line from the on-site waste water treatment plant. Upon reaching mud pit #1, the soil surrounding and beneath the mud pit was removed. An approximate seven square foot area of soil was excavated from around mud pit #1 to a depth of approximately eleven feet bgs to ensure that locally impacted soil was removed. Upon completion of the excavation, five confirmatory soil samples, E-2 through E-6, were collected, one from each wall at approximately 8 to 10 feet bgs, the depth where impact was previously noted in this area from former probe P-1, and one from the base of the excavation. The soil samples were analyzed for VOCs and total RCRA metals. A map illustrating the excavation and sample locations in this area is included as Figure 14.

Analytical results of the confirmatory soil samples collected from the excavation of mud pit #1 and former probe P-9 were below ASLs for all VOCs and total RCRA metals.

16.2 Mud Pit #3 Excavation

The initial excavation of mud pit #3 resulted in an approximately eight square foot excavated area to a depth of approximately 11.5 feet bgs. During the excavation, a 12 inch galvanized steel whistle was observed approximately two feet west of the former mud pit. According to Mr. Bob King, of Modine, this whistle receives stormwater runoff and is an active line. Therefore, this line was not removed and excavation activities terminated at this whistle. Five confirmatory soil samples, E-7 through E-11, were collected and analyzed for VOCs and total RCRA metals. One soil sample was collected from each wall of the excavation and one from the base.

Total lead levels for each of the confirmatory soil samples (E-7 - E-11) collected from mud pit #3 were above the ASL for lead of 240 ppm. These results are presented below:

Sample	Total Lead Result (ppm)
E-7 (base)	513.0
E-8 (west wall)	981.0
E-9 (north wall)	476.0
E-10 (south wall)	2,140.0
E-11 (east wall)	901.0

Sample E-11 collected from the east wall of the excavation is located at the west building wall.

Based upon the analytical results from the samples collected from the walls and base of the initial excavation it was determined that additional excavation was required. The additional excavation was conducted on October 9, 1997. The excavation was extended to the north, south, and west of the initial excavation. Due to the proximity of the building foundation further excavation was not possible to the east. The additional excavation was extended such that it encompassed an approximate area of 14 feet by 17 feet to a depth of approximately 13.5 feet bgs. At a distance of approximately 14 feet west of the building, an eight inch sprinkler main was encountered at a depth of approximately eight feet bgs. Excavation was terminated at this sprinkler main. The additional excavation was extended approximately 4.5 feet north and south of the previously excavated area. Additional confirmatory soil samples E-17 through E-20, were collected; one each from the north, south, and west walls and one from the base. The soil samples were analyzed for total RCRA metals. A map illustrating the excavation area and sample locations is included as Figure 15.

Total Lead levels for each of the additional confirmatory soil samples (E-17 - E-20) collected from mud pit #3 were above the ASL for lead of 240 ppm. However, it should be noted that the sample from the base (E-17) barely exceeded the ASL with a concentration of 251 ppm. It should also be noted that bedrock was encountered in portions of the base of this excavation. These results are presented below:

Sample	Total Lead Result (ppm)
E-17 (base)	251.0
E-18 (west wall)	1,460.0
E-19 (north wall)	541.0
E-20 (south wall)	601.0

16.3 Mud Pit #4 Excavation

The excavation surrounding mud pit #4 encompassed an approximately six square foot area to a depth of approximately eight feet bgs. The excavation was located north of the concrete structure housing two aboveground storage tanks and associated piping. This concrete pad acted as the southern limit of excavation. During excavation, an eight inch diameter sprinkler main was observed approximately two feet north of the former mud pit, at a depth of approximately four feet bgs. This sprinkler main acted as the northern limit of excavation. Upon completion of this excavation, five confirmatory soil samples, E-12 through E-16, were collected from each wall and from the base of the excavation. The soil samples were analyzed for VOCs and total RCRA metals. A map illustrating the excavation area and sample locations is included as Figure 16.

Analytical results of the confirmatory soil samples (E-12 - E-16) collected from the excavation of mud pit #4 were below ASLs for all VOCs and Total RCRA Metals.

16.4 Disposal of Excavated Soil

Soil removed from the excavations was segregated and placed on plastic sheeting near the excavations and completely covered with additional plastic sheeting. A waste characterization sample from each pile was analyzed for TCLP lead. TCLP lead analytical results of waste characterization samples from three of the four stockpiles were less than 0.50, 2.80, and 0.80 ppm respectively. These results indicated that the soil in these stockpiles was not considered hazardous by virtue of lead toxicity and therefore, could be disposed as Special Waste. The waste characterization sample from the fourth stock pile, primarily associated with mud pit #3, had a TCLP lead concentration of 9.50 ppm, which is above the 5.0 ppm hazardous characteristic

threshold. Therefore, the soil in this stockpile required disposal as a Hazardous Waste. A confirmatory waste characterization sample from the same pile exhibited a TCLP lead concentration of 9.60 ppm, confirming that this stockpiled soil required disposal as hazardous waste.

Debris from the excavated mud pits was stockpiled separately from excavated soil. This debris included the cement linings, PVC piping, and scrap metal associated with the mud pit cover.

16.5 Conclusions

Based upon the analytical results, it is believed that impacted soil above the ASL for lead was completely removed in the area of former probe P-9, mud pit #1, and mud pit #4. Due to the presence of underground piping and the building, further excavation to the north, west, and east was not possible in the area of former mud pit #3. It is Dames & Moore's opinion that an undefined quantity of locally isolated lead impacted soil remains in place.

17.0 Monitoring Well Installation at the Former Hulett Lagoon - Dames & Moore Letter Report Dated August 20, 1998

A monitoring well, MW-5, was installed at the former Hulett Lagoon in Camdenton, Missouri. The former lagoon is located approximately 1,000 feet northeast of the Modine facility and appears, based upon the results of a previous field fracture survey, to be the source of the observed TCE impact to groundwater. The purpose of this investigation was to determine the presence or absence of VOCs, in particular TCE, in the groundwater underlying the former Hulett Lagoon.

The subsurface investigation field activities were conducted from July 7, 1998 through July 16, 1998. The well is located just southwest of the confines of the former lagoon. The shallow non-lithified soil was drilled using a truck mounted hollow stem auger drilling rig. There was no field evidence of impact to the soils based on the PID readings and olfactory indications; therefore, no soil samples were submitted to the laboratory for analysis.

Once bedrock was encountered, a temporary casing was set in place and the hole was re-entered and diamond cored (NX core) to a depth of approximately 104 feet bgs. Following coring

activities, the hole was re-entered and reamed out to a depth of approximately 118 feet bgs. Groundwater was encountered at an approximate depth of 105 feet bgs. The original intent had been to core the well to total depth. However, water loss was encountered during the drilling process beginning at a depth of approximately 22 feet bgs. Water loss appears to have occurred due to the presence of open fractures and void spaces. The water loss problem increased as the boring was deepened, so that the coring operation had to be terminated at a depth of 104 feet bgs. A total of approximately 5,000 gallons of potable water was lost to the formation.

The bedrock was continuously cored using a ten foot core barrel. As each core run was removed from the barrel, the bedrock was field screened using the PID. The probe of the PID was run along the length of the core to determine the presence of organic vapors. There was no evidence of impact to the bedrock based on the PID readings and olfactory indications.

Permanent surface casing was installed in competent bedrock to a depth of approximately 37 feet bgs. This depth was chosen in order to case off several void spaces which had been encountered during the drilling, notably the void space from 35.0 to 36.5 feet bgs. The well is completed with a screen length of thirty feet and contains a filter pack that extends approximately four feet above the top of the screen.

A groundwater sample and a duplicate sample were collected from MW-5 for analysis. Additionally, a water sample was collected from the decontamination water holding tank and the coring water holding tank. The results obtained for each of the samples are summarized below:

- Monitoring Well MW-5: The groundwater sample collected from MW-5 exhibited a concentration of TCE at 484.1 ppb and cis-1,2-dichloroethene at 28.0 ppb. A duplicate sample was collected from MW-5 which exhibited a concentration of TCE of 458.5 ppb and cis-1,2-Dichloroethene of 28.2 ppb.

- Core Holding Tank: The water collected from the core holding tank originated at the facility and exhibited a TCE concentration of 3.0 ppb.

- Decontamination Holding Tank: The water collected from the decontamination holding tank originated at the facility and exhibited a TCE concentration of 3.2 ppb.

17.1 Geophysical Logging

On July 31, 1998, geophysical logging was conducted in MW-5. A downhole camera was also placed in an on-site monitoring well, MW-4. This data has been collected and is currently being compared to previously collected data to further determine the connection in the bedrock and groundwater flow beneath the Modine facility and the former Hulett Lagoon.

17.2 Groundwater Elevations

Groundwater depths relative to top of casing were determined for all five monitor wells on July 31, 1998. The groundwater elevations (Figure 17) confirm the generally trough-like configuration of the groundwater potentiometric surface, which has been observed in previous gauging events. MW-1 is approximately in the downgradient center of the trough-like surface. Data from MW-5 demonstrate that groundwater is flowing generally to the southwest, in the direction of the Modine facility from the former Hulett lagoon. This flow direction is parallel to the direction of the primary fracture set identified in the 1996 Fracture System Investigation.

17.3 Conclusions

TCE was detected in the groundwater sample collected from MW-5 located at the former Hulett Lagoon. The concentration of TCE detected significantly exceeds the MCL of 5 ppm for TCE. Groundwater appears to flow southwest from the former Hulett Lagoon towards the Modine facility. Based upon these results, it is Dames & Moore's opinion that the source of the TCE in the groundwater beneath the Modine facility is the former Hulett Lagoon.

18.0 Conclusions

Modine believes that a sufficient volume of investigative work has been conducted at the Modine Heat Transfer facility in Camdenton Missouri to adequately assess the potential for the Site to be a contributing source to the observed groundwater impact in the Camdenton area. Modine also believes that it has been successfully demonstrated that the former Hulett Lagoon is the primary source for the TCE impact to groundwater observed at the Modine facility. The fracture survey strongly suggested the presence of an off-site source and the installation of MW-5 at the former

lagoon demonstrated TCE concentrations at that location three times higher than the highest concentration obtained from groundwater samples collected from wells at the Modine facility.

A few on-site concerns and/or areas for potential follow-up activities currently exist at the Site. These areas of concern are summarized in the following bulleted paragraphs:

- B-13 at a depth of 8.5 feet to 13 feet bgs exhibited the highest VOC concentration in soil (TCE at 204 ppm) at the Site. This sample was collected along the former drain line on the west side of the building. Modine filed a deed notification in October of 1996 detailing the aerial extent and concentrations of the VOC impact to soil at the facility. However, it should be noted that none of the VOC concentrations exceeded the corresponding ASLs.
- Trapped water beneath the floor exhibited VOC concentrations in excess of the VOC concentrations in the soil beneath the floor for the vast majority of the samples collected. Since the trapped water does not appear to be adversely impacting the underlying soil to a significant degree and the monorail vapor degreaser has been removed along with the gravel subgrade and the floor in the area brought to grade and capped with concrete, additional investigation in this area does not appear warranted.

- An undefined quantity of locally isolated lead impacted soil remains in place at the former mud pit #3 location. Complete removal was not possible due to the presence of underground piping and the building. Since lead solder or other potentially lead generating processes have never been employed at the Site, it appears that the lead in the soil is native to the area or was included in the fill used during building construction.

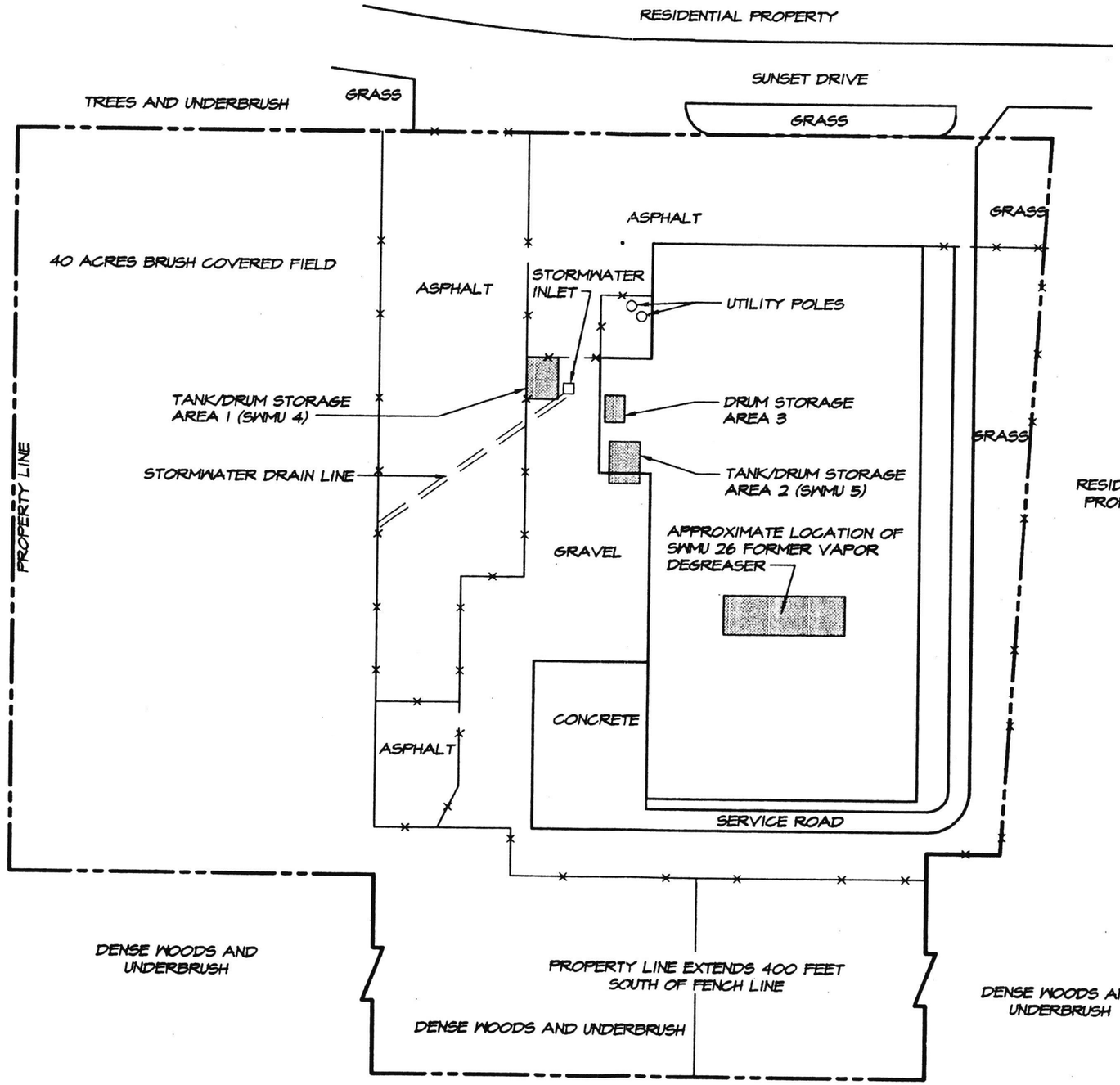
Planned Future Tasks

Modine has begun the procedures to conduct a groundwater tracing event at the facility. The proper documents have been completed and submitted to the MDNR to obtain permission to conduct this trace. As of the date of this report, a response has not been received from the MDNR. However, dye bugs consisting of activated charcoal were placed in all of the on-site monitoring wells (MW-1, MW-2, MW-3, MW-4) for the purpose of background samples to determine if fluorescein dye exists in the groundwater beneath the facility.

Interpretation of the geophysical logging conducted in monitoring well MW-5 and the downhole camera survey conducted in monitoring well MW-4 is ongoing and maybe continued. This data

will be compared to previously collected data to further determine the connection in the bedrock and groundwater flow beneath the Modine facility and the former Hulett Lagoon.

FIGURES



LEGEND

APPROXIMATE FORMER SWMU LOCATIONS

NORTH

100 0 50 100 200

FIGURE 1
FORMER TANK / DRUM STORAGE AREAS

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
DRAWN BY: JMS	CHK'D BY: DJP
SCALE: AS SHOWN	

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY
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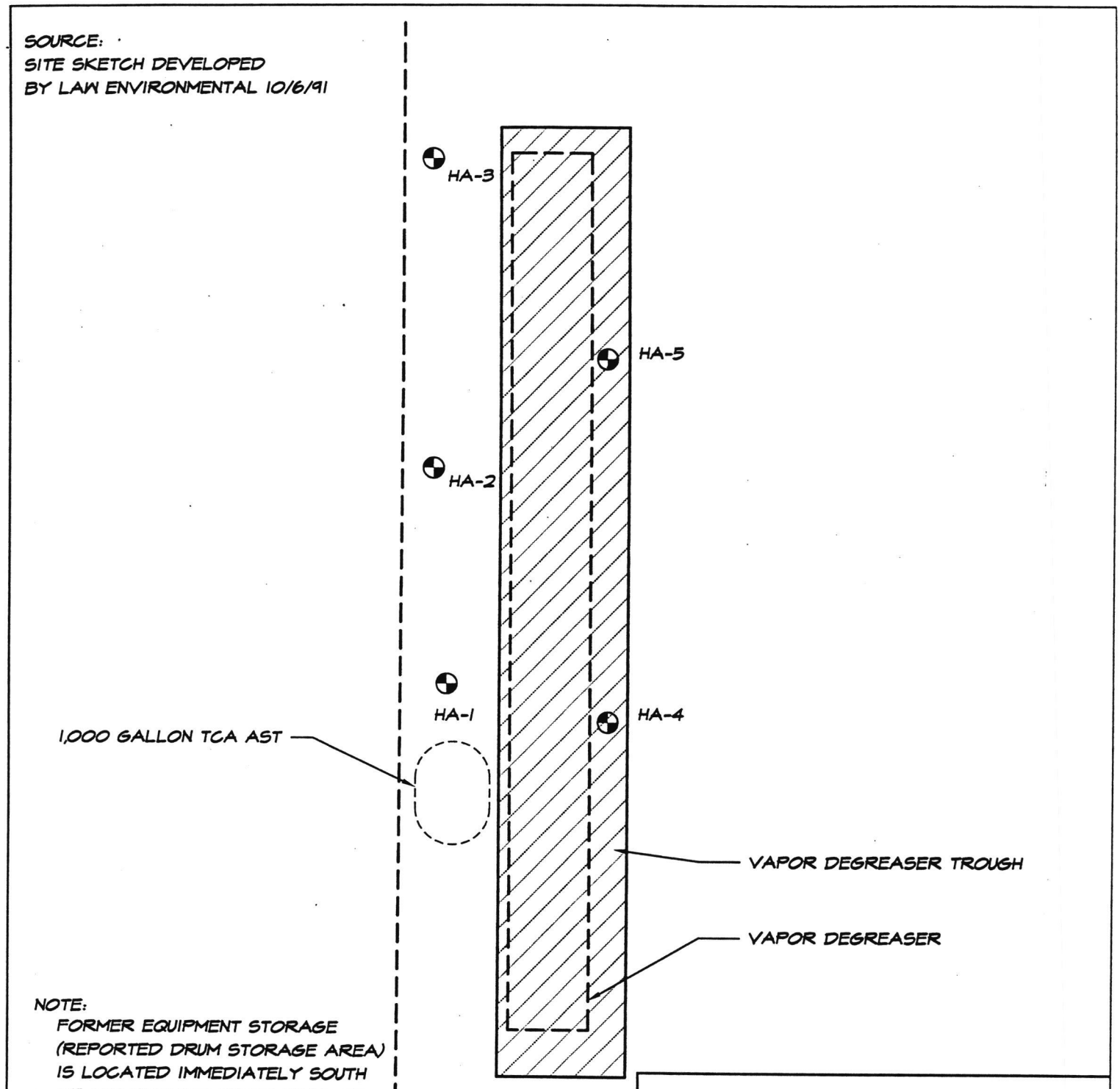

FIGURE 2
BORINGS AT VAPOR DEGREASER
LAW - 1991

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE:	Aug. 21, 1998
JOB NO.:	27397-035-045
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SCALE:	AS SHOWN

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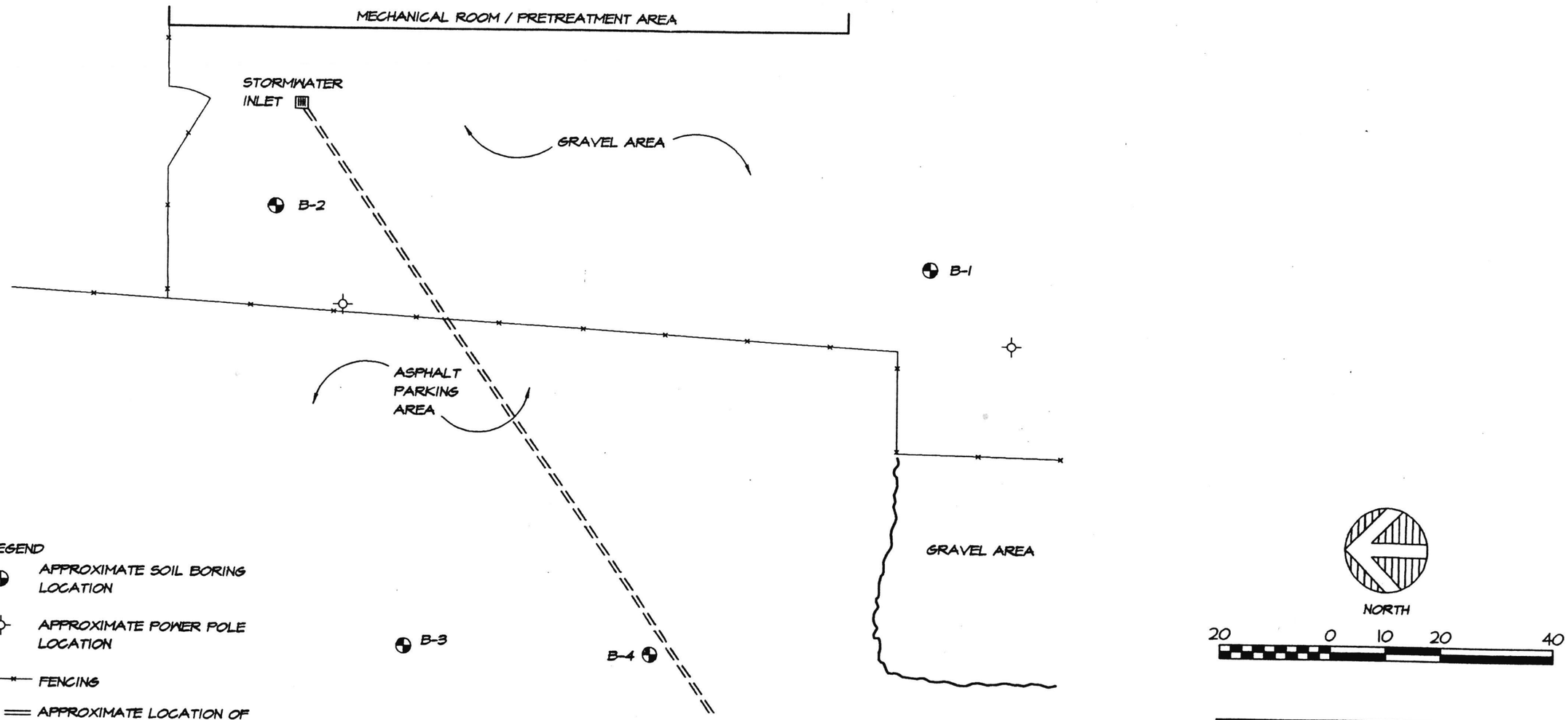

LEGEND

- APPROXIMATE SOIL BORING LOCATION
- APPROXIMATE POWER POLE LOCATION
- FENCING
- APPROXIMATE LOCATION OF STORM WATER DRAIN PIPE
- (2.0-4.0ft) DEPTH FROM WHICH SAMPLE WAS COLLECTED
- (10/18/91) DATE SAMPLE WAS COLLECTED

SOURCE:
SITE SKETCH CEVELOPED BY LAW ENVIRONMENTAL 10/16/91

FIGURE 3
BORINGS AT FORMER DRUM STORAGE AREAS ON WEST SIDE OF BUILDING - LAW, 1991

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE:	Aug. 21, 1998
JOB NO.:	27397-035-045
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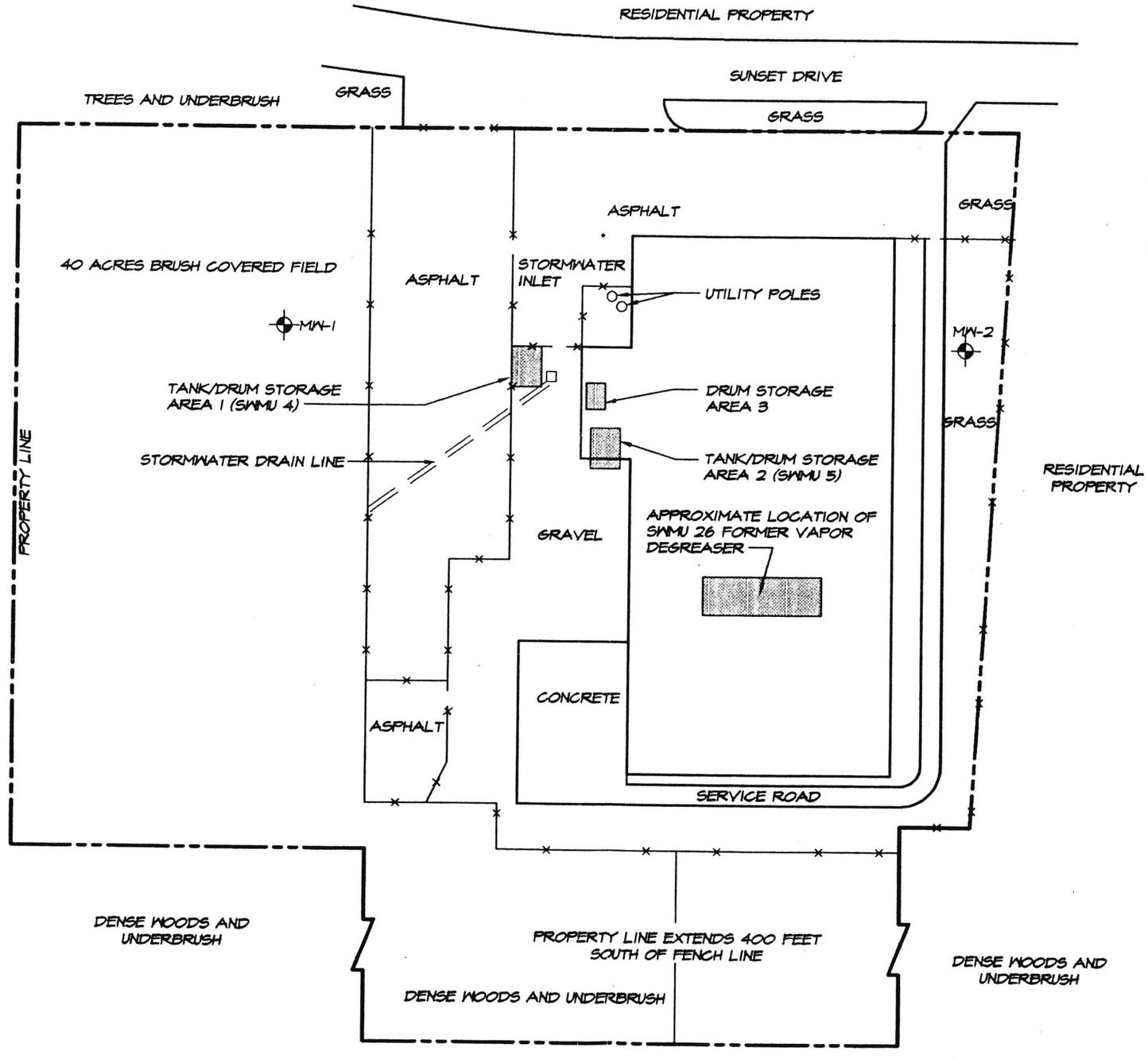

LEGEND

- APPROXIMATE FORMER SWMU LOCATIONS
- APPROXIMATE LOCATION OF EXISTING GROUNDWATER MONITORING WELLS

NORTH

100 0 50 100 200

FIGURE 4
MONITORING WELLS MW-1 AND MW-2 LOCATIONS

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE:	Aug. 21, 1998
JOB NO.:	27397-035-045
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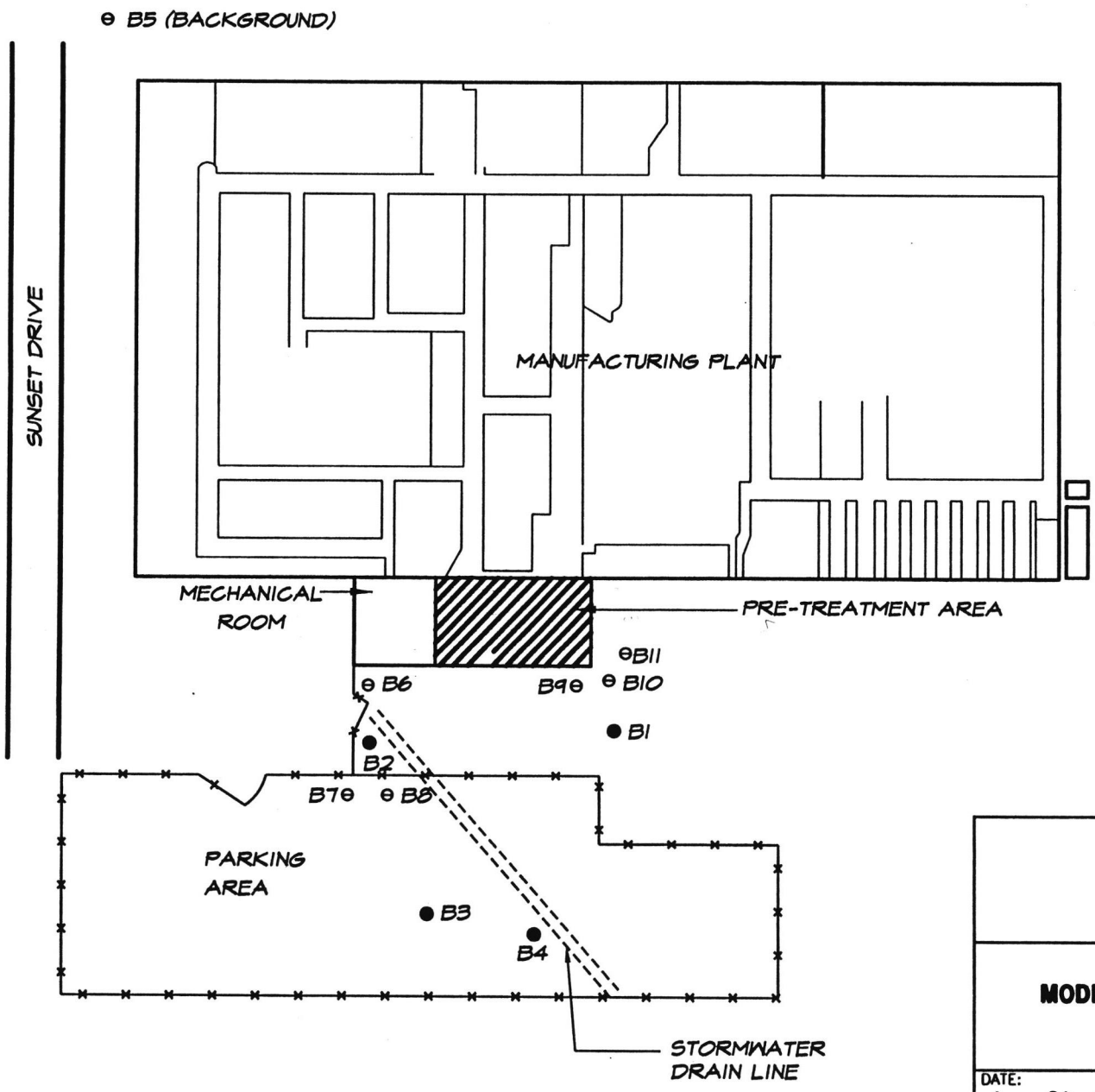

FIGURE 5
BORING LOCATIONS
LAW - 1993

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
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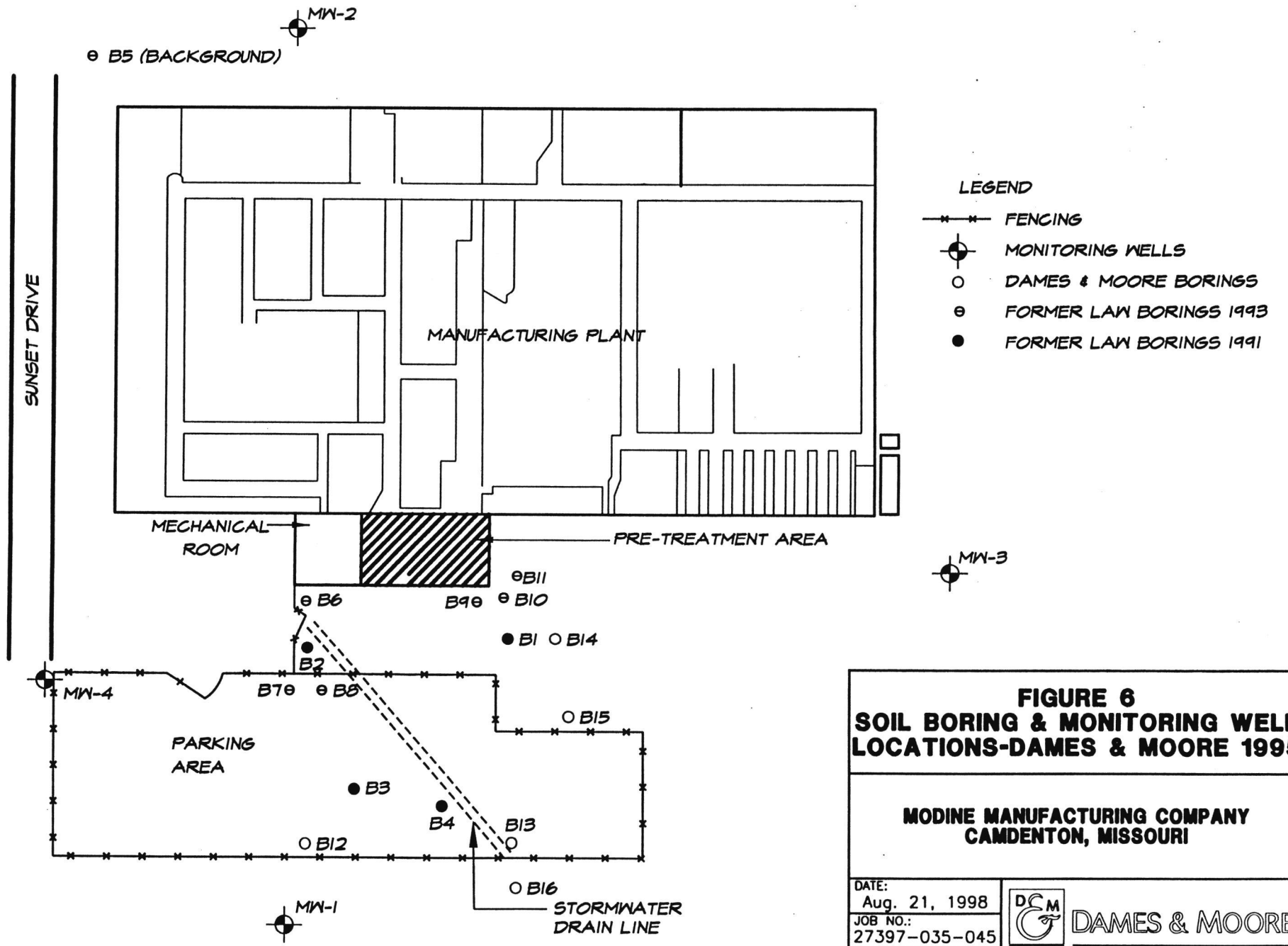

FIGURE 6
SOIL BORING & MONITORING WELL LOCATIONS-DAMES & MOORE 1995

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
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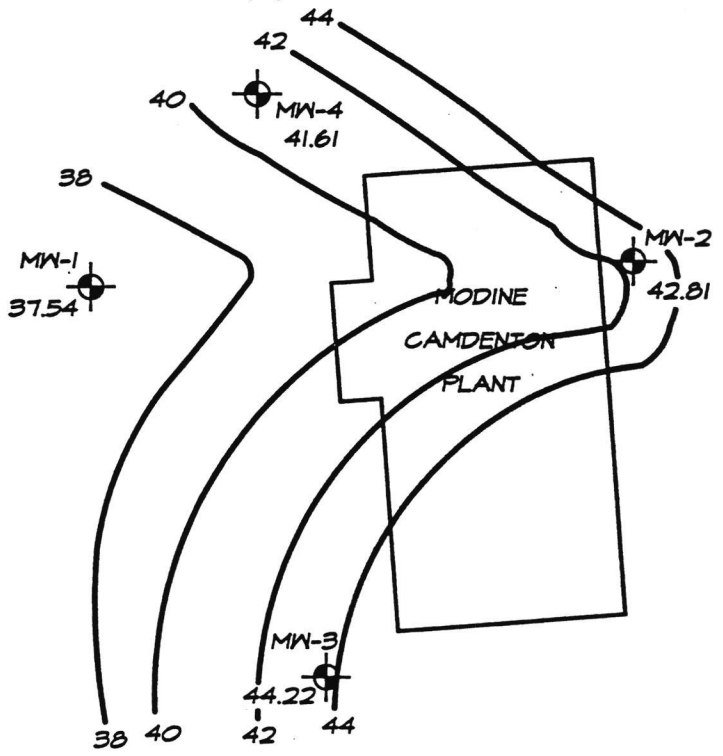

LEGEND

MONITORING WELL

GROUNDWATER CONTOUR

200 0 100 200 400

FIGURE 7
POTENTIOMETRIC SURFACE MAP - NOVEMBER 1995

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
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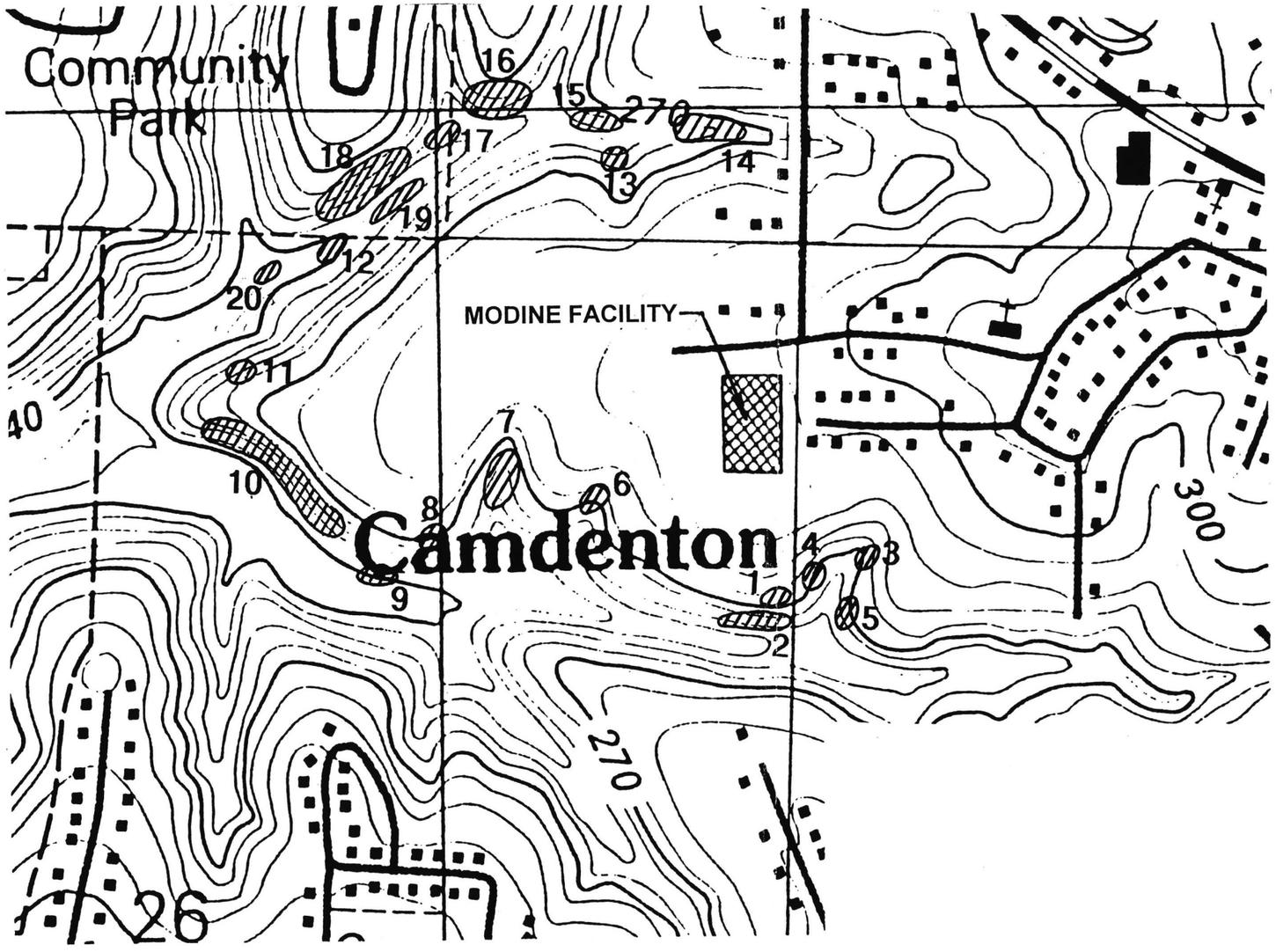

NORTH

LEGEND

OUTCROP LOCATION

FIGURE 8
OUTCROP LOCATION MAP - FIELD FRACTURE SURVEY

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
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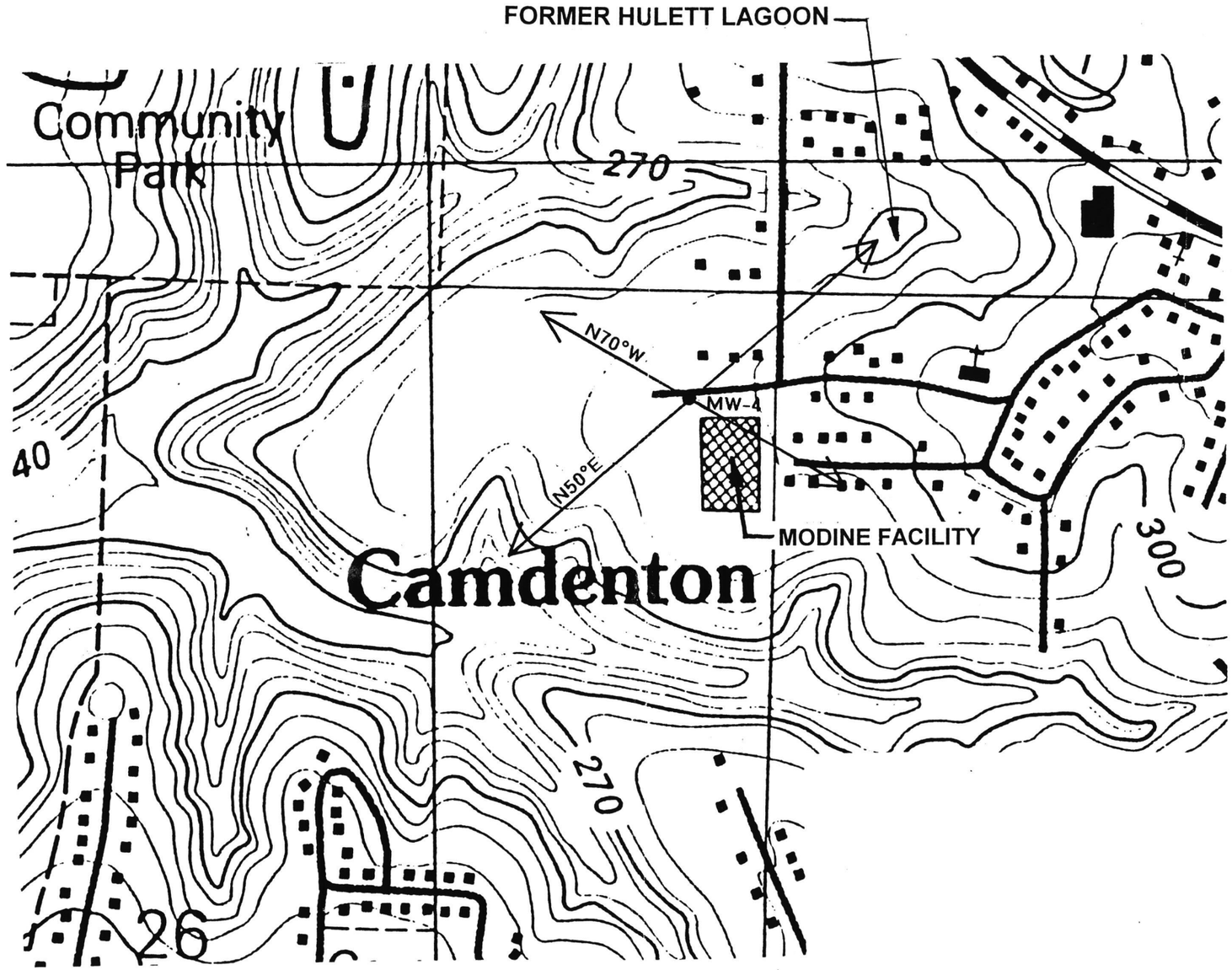

NORTH

FIGURE 9
FRACTURE ORIENTATION ON TOPOGRAPHIC BASE

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
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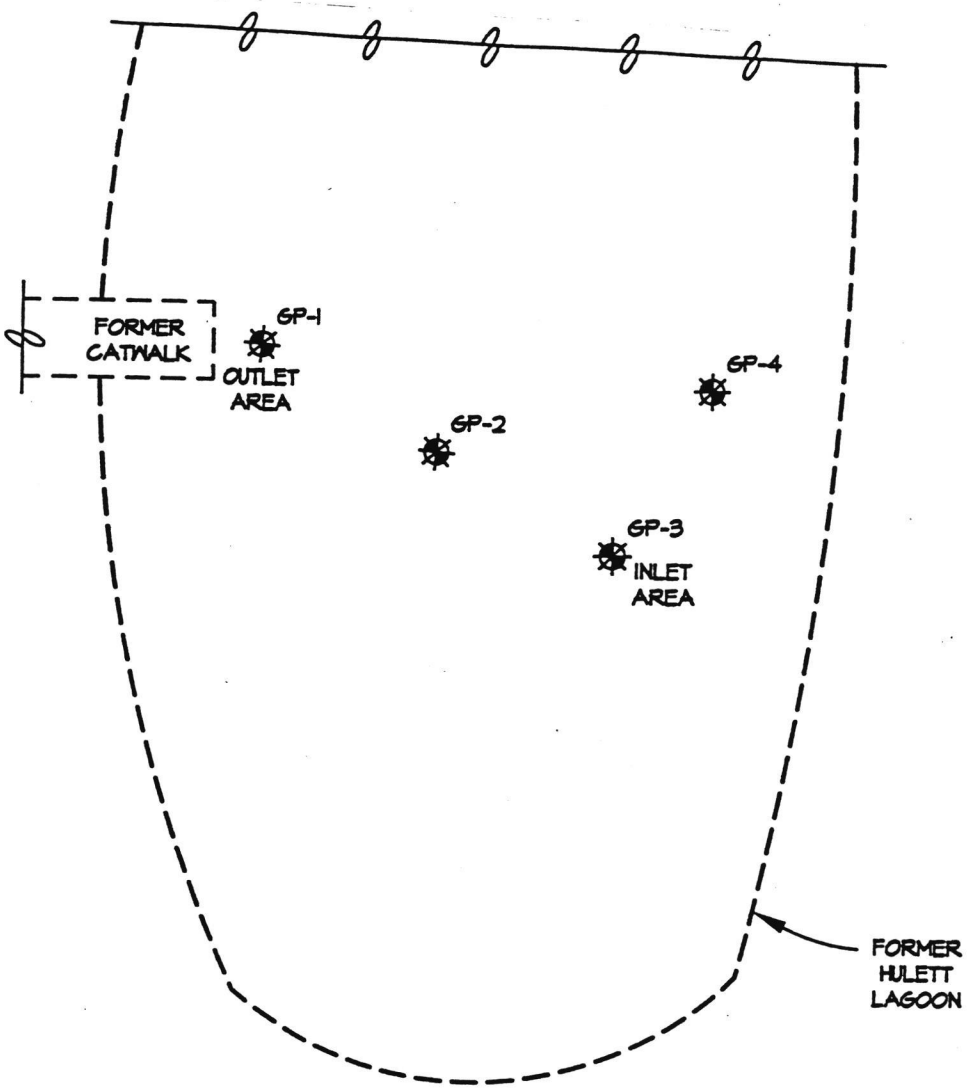

TREE

N
W E
S

20 0 10 20 40

FIGURE 10
PROBE LOCATIONS
FORMER HULETT LAGOON

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
DRAWN BY: JMS	CHK'D BY: DJP
SCALE: AS SHOWN	

DAMES & MOORE GROUP
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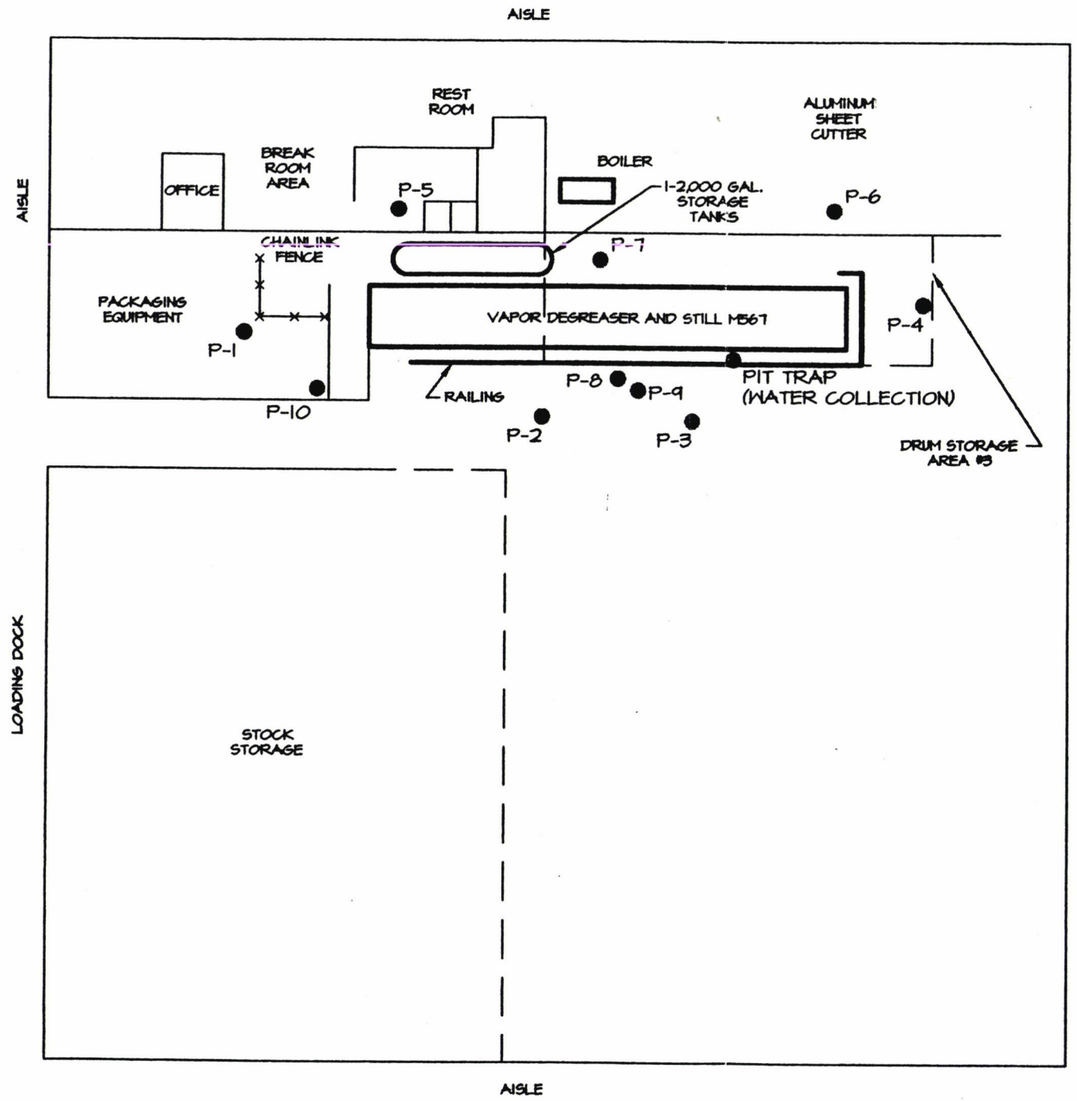

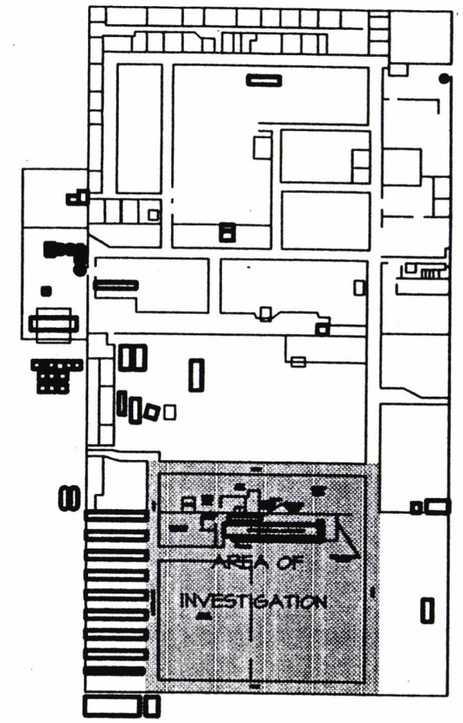

KEY MAP
N.T.S.

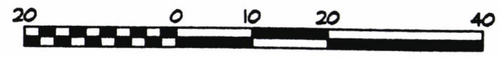

FIGURE 11
VAPOR DEGREASER
PROBE LOCATIONS

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
DRAWN BY: JMS	CHK'D BY: DJP
SCALE: AS SHOWN	

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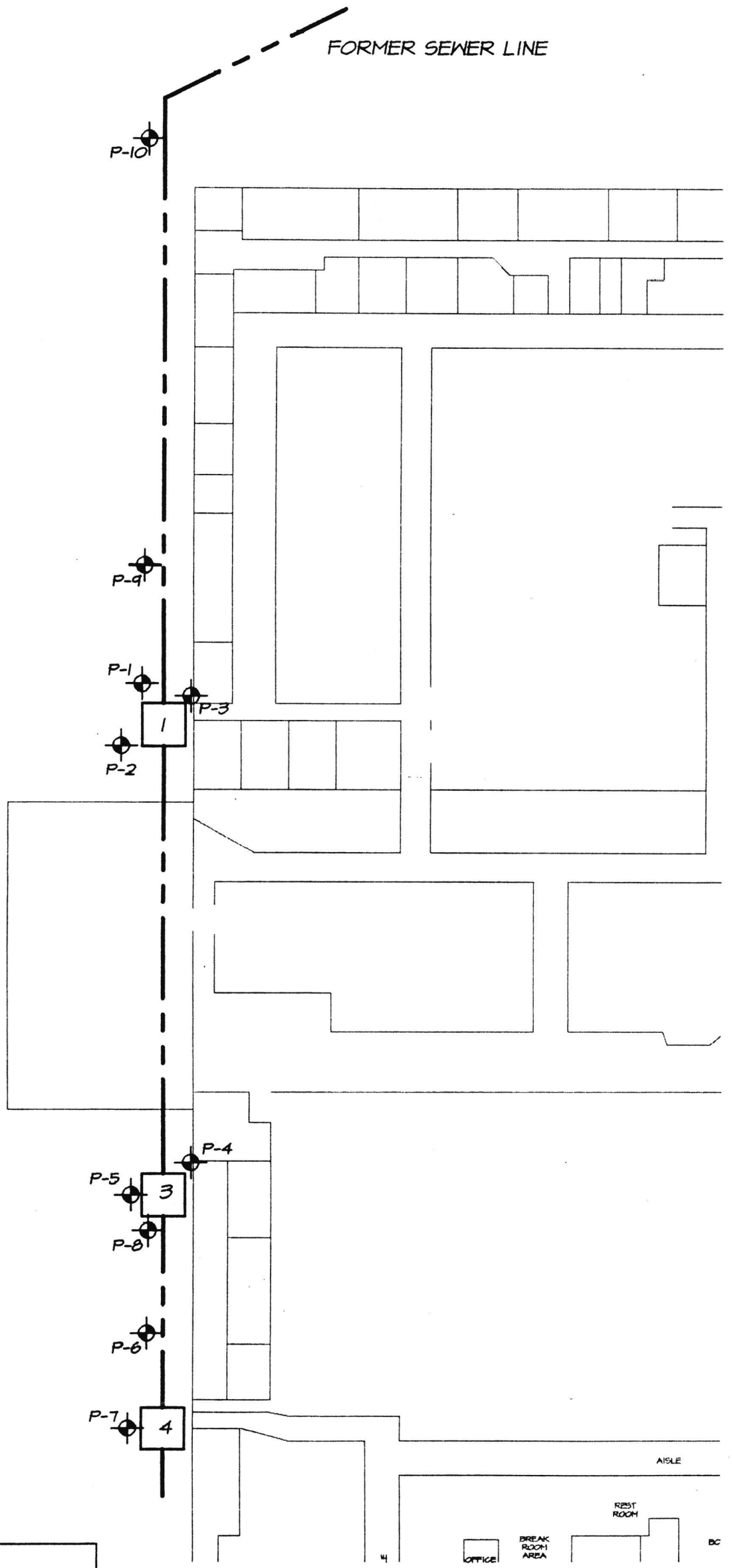

LEGEND

PROBE LOCATION

1 MUD PIT

N

30 0 15 30 60

FIGURE 12
PROBE LOCATIONS
FORMER MUD PITS (SWMU #2)

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
DRAWN BY: JMS	CHK'D BY: DJP
SCALE: AS SHOWN	

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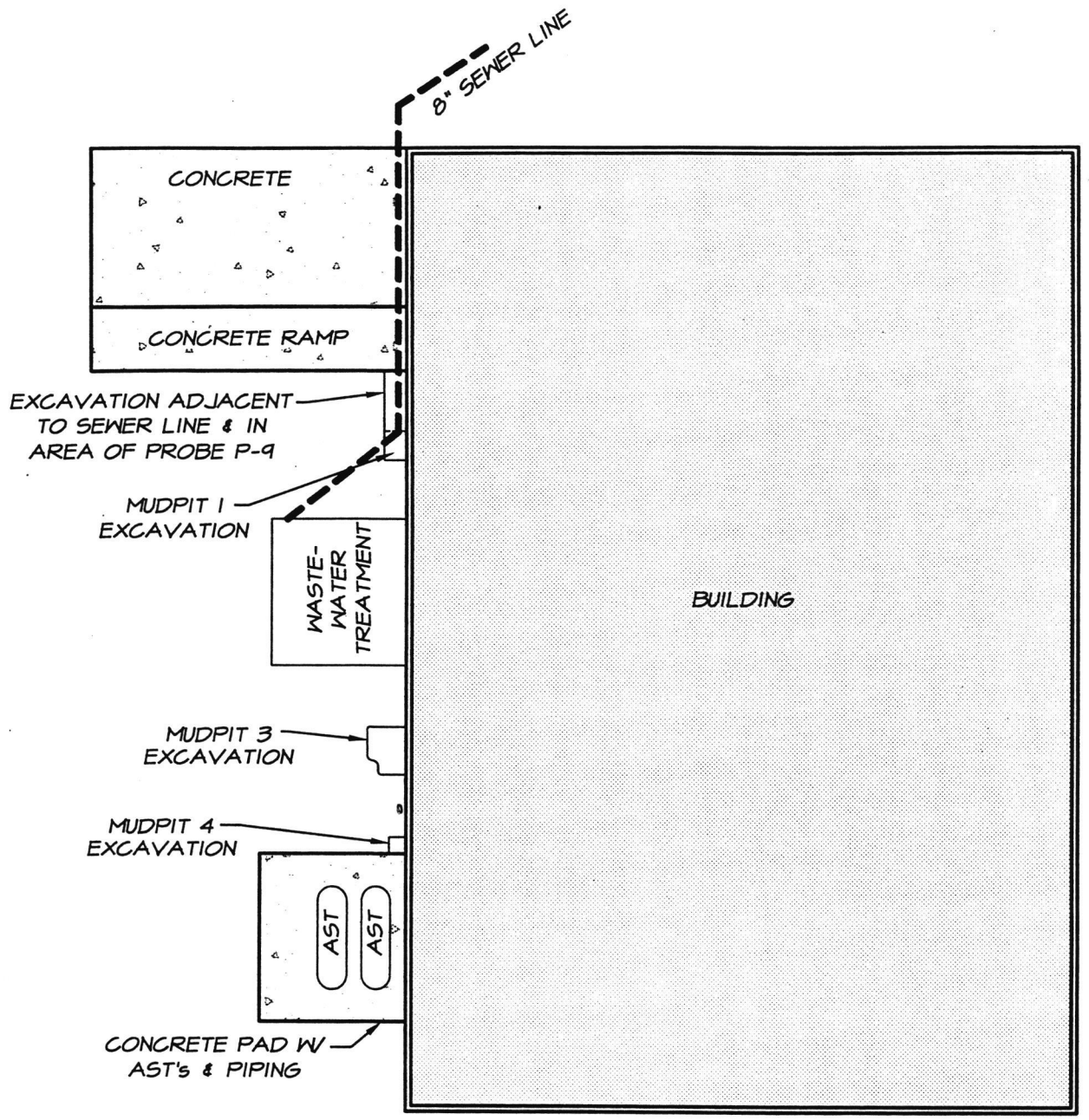

60 0 30 60 120

N

FIGURE 13
MUD PIT EXCAVATION LOCATIONS

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
DRAWN BY: JMS	CHK'D BY: DJP
SCALE: AS SHOWN	

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FAX: 314-993-4895

R:\ENV\27397.035\MOD-F13.DWG 08/21/98

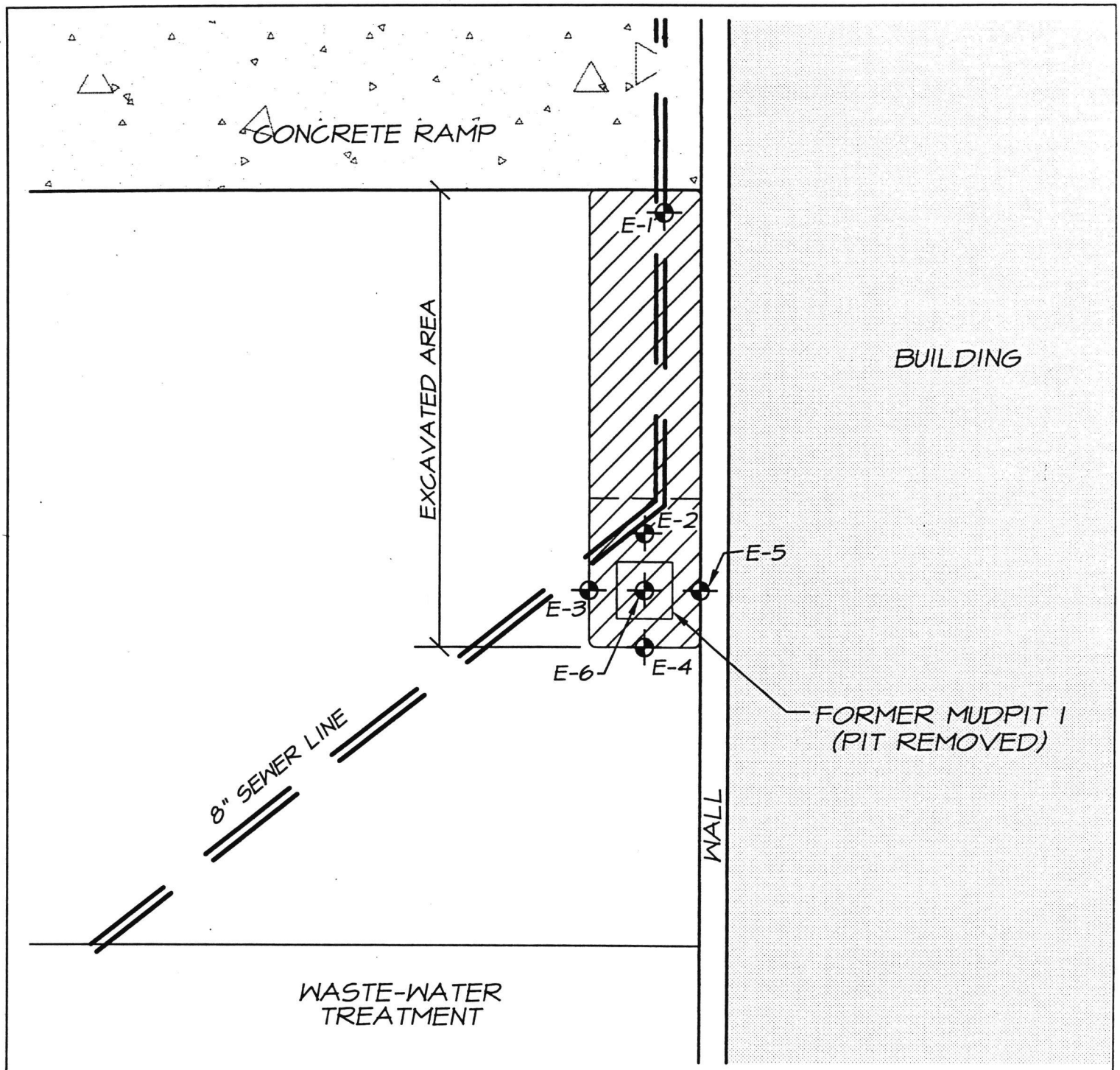


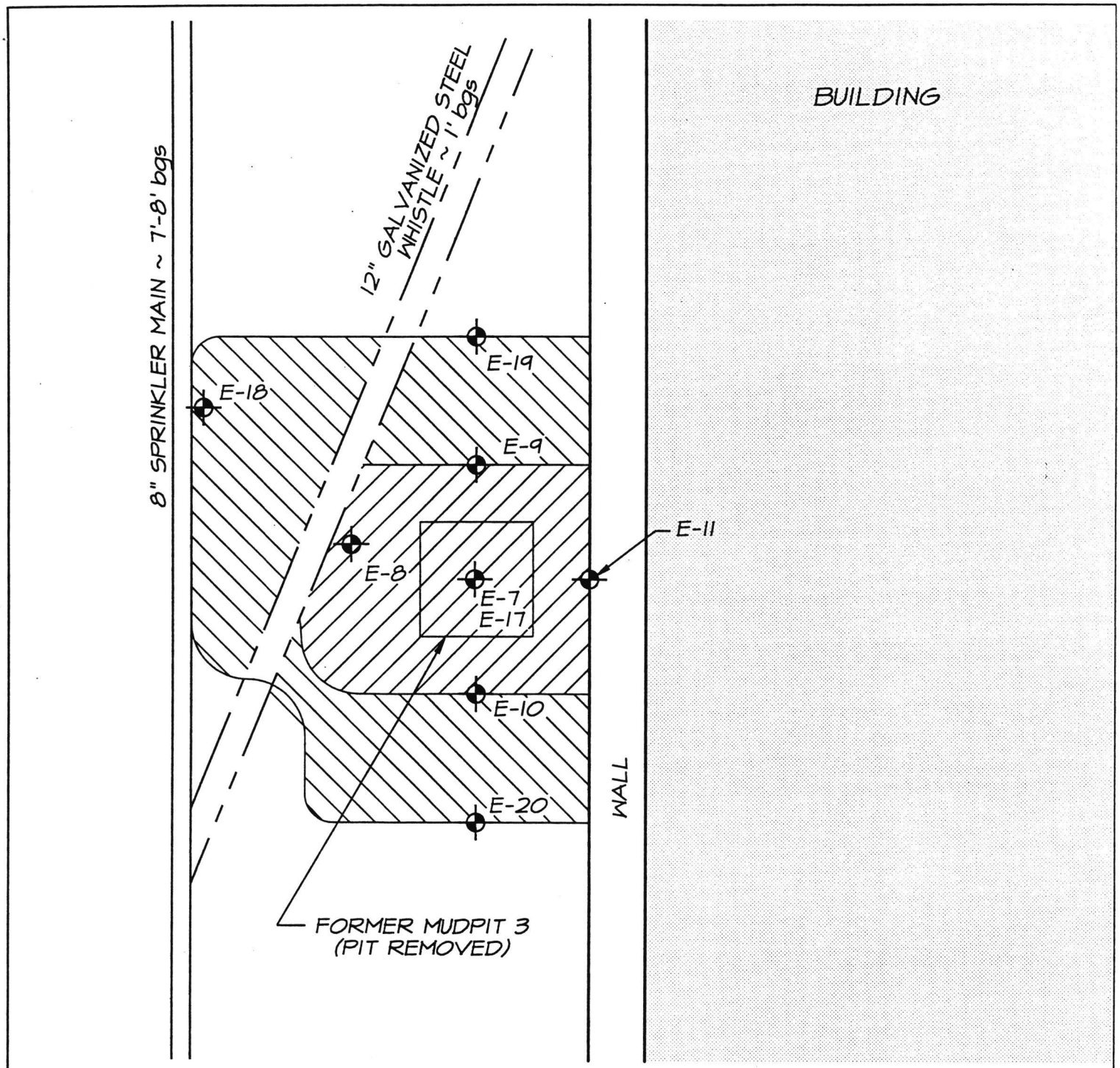
FIGURE 14
FORMER MUD PIT 1 AND FORMER PROBE P-9 EXCAVATION

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE:	Aug. 21, 1998
JOB NO.:	27397-035-045
DRAWN BY	JMS
CHK'D BY	DJP
SCALE:	AS SHOWN

DAMES & MOORE GROUP
A DAMES & MOORE GROUP COMPANY
721 EMERSON ROAD, SUITE 220
ST. LOUIS, MISSOURI 63141
PHONE: 314-993-4599
FAX: 314-993-4895

R:\ENV\27397.035\MOD-F14.DWG 08/21/98



EXTENT OF EXCAVATION 10-2-97 TO A DEPTH OF ~ 11.5' bgs.

EXTENT OF EXCAVATION 10-9-97 TO A DEPTH OF ~ 13.5' bgs.

5 0 2.5 5 10

N

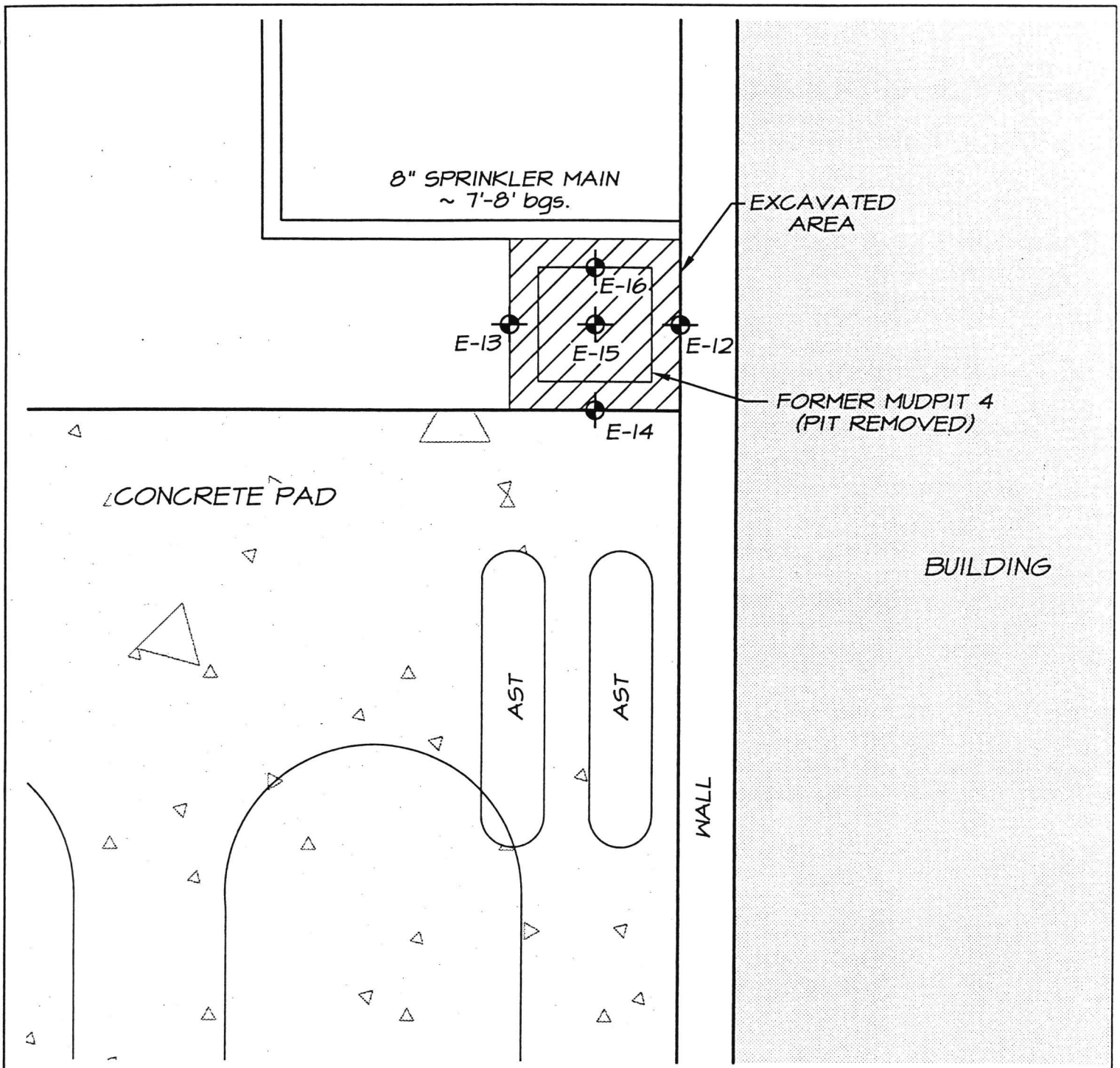
R:\ENV\27397.035\MOD-F15.DWG 08/21/98

FIGURE 15
FORMER MUD PIT 3 EXCAVATION

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE:	Aug. 21, 1998
JOB NO.:	27397-035-045
DRAWN BY	JMS
CHK'D BY	DJP
SCALE:	AS SHOWN

DAMES & MOORE GROUP
A DAMES & MOORE GROUP COMPANY
721 EMERSON ROAD, SUITE 220
ST. LOUIS, MISSOURI 63141
PHONE: 314-993-4599
FAX: 314-993-4895



5 0 2.5 5 10

N

FIGURE 16
FORMER MUD PIT 4 EXCAVATION

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
DRAWN BY: JMS	CHK'D BY: DJP
SCALE: AS SHOWN	

DAMES & MOORE
GROUP
A DAMES & MOORE GROUP COMPANY
721 EMERSON ROAD, SUITE 220
ST. LOUIS, MISSOURI 63141
PHONE: 314-993-4599
FAX: 314-993-4895

R:\ENV\27397.030\F4-MUD4.DWG 11/10/97

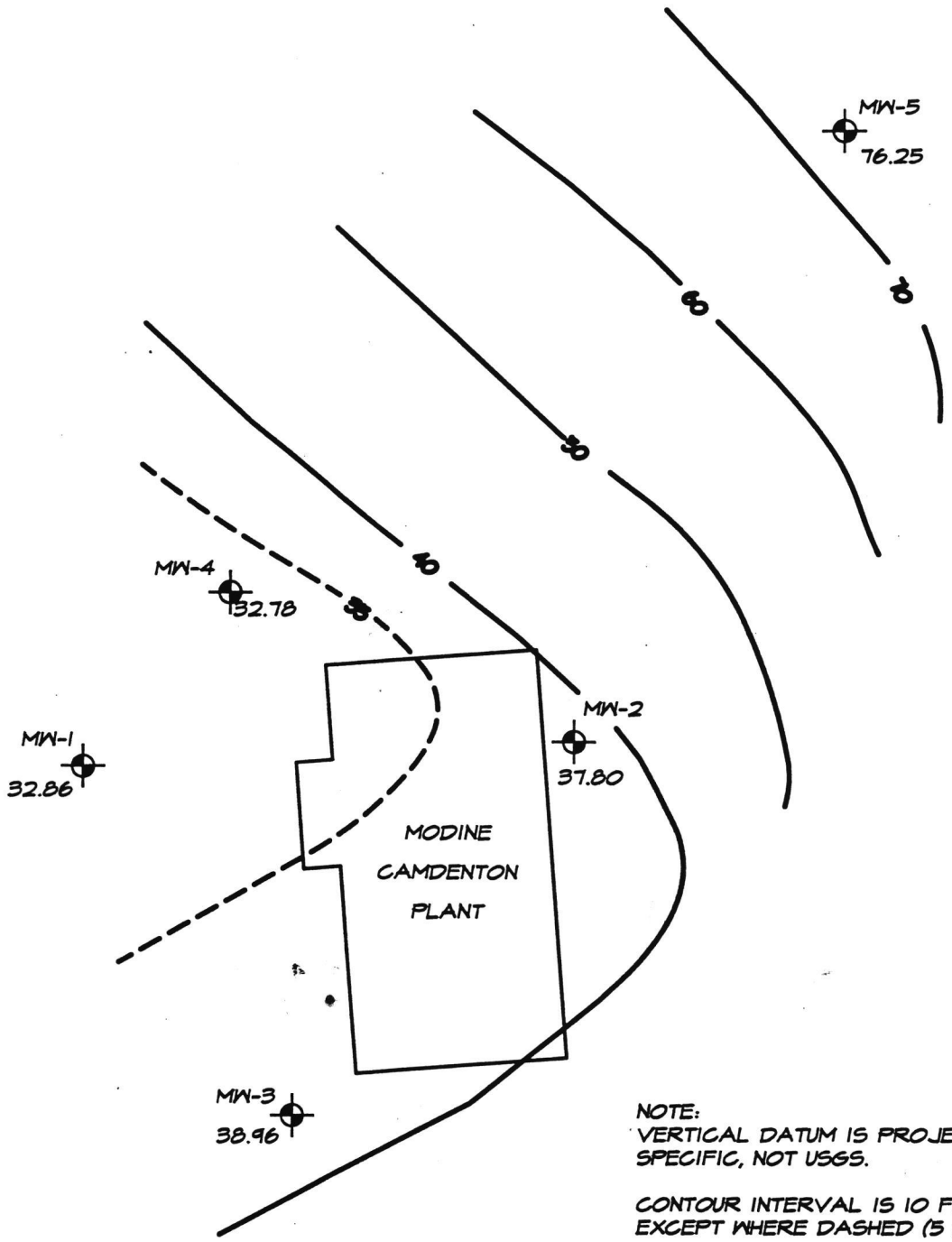


FIGURE 17
POTENTIOMETRIC SURFACE MAP - 1999

MODINE MANUFACTURING COMPANY
CAMDENTON, MISSOURI

DATE: Aug. 21, 1998	
JOB NO.: 27397-035-045	
DRAWN BY: JMS	CHK'D BY: DJP
SCALE: AS SHOWN	

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